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Opacity and Transparency in Phonological Change

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Abstract

Modern High German final obstruent devoicing is usually thought to descend from Middle German devoicing without any chronological break, despite the fact that the graphic representation of final devoicing ceased in the Early Modern period. However, an alternative account holds that the spelling change reflects the actual loss of the devoicing rule, and that therefore the modern rule has an independent origin. In particular, apocope of final schwa has been suggested as the cause of the loss of devoicing in Early Modern German.

According to this theory, loss of devoicing occurred because schwa apocope rendered the devoicing rule opaque, and hence hard to learn. If true, we expect to see some evidence for opaque devoicing during the period that apocope was in progress. In accordance with this prediction, we found a statistically significant correlation between apocope and absence of final devoicing in a number of German texts of the 14th and 15th centuries. After the 15th century, devoicing is lost across the board, which correlates with the completion of schwa apocope and the loss of the opaque devoicing rule. This confirms our theoretical predictions. If apocope had not rendered devoicing opaque, we would have to conclude that Early Modern German schwa apocope was an instance of rule insertion. However, the structural description of neither apocope nor devoicing leads us to expect insertion. Instead, Modern German final devoicing appears to be an instance of rule re-affirmation, which entails that the devoicing rule, though opaque, remained productive in some dialects.

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ABSTRACT

OPACITY AND TRANSPARENCY IN PHONOLOGICAL CHANGE

Jonathan Gress-Wright

Donald Ringe

Final obstruent devoicing is attested in both Middle and Modern High German, and the

modern rule is usually assumed to have been directly inherited from the medieval rule

without any chronological break (Reichmann & Wegera 1993), despite the fact that the

graphic representation of final devoicing ceased in the Early Modern period. However, an

alternative account holds that the spelling change reflects the actual loss of the devoicing

rule, and that therefore the modern rule has an independent origin (Mihm 2004). In

particular, apocope of final schwa has been suggested as the cause of the loss of

devoicing in Early Modern German (Kranzmayer 1956), which, if true, aligns

developments in German with contemporary developments in Yiddish (King 1980). Loss

of devoicing in Yiddish supposedly occurred because schwa apocope rendered the

devoicing rule opaque, and hence hard to learn (Kiparsky 1972). If schwa apocope is the

cause of the loss of final devoicing in Early Modern German as well, then we expect to

see some evidence for opaque devoicing during the period that apocope was in progress,

which is precisely what we find. A statistically significant correlation between apocope

and absence of final devoicing can be shown for a number of German texts of the 14th

and 15th centuries, i.e. words that never had final schwa still tend to show devoicing,

while words that formerly had a final vowel tend not to show devoicing. After the 15th

century, devoicing is lost across the board, which correlates with the completion of schwa apocope and the loss of the opaque devoicing rule. This confirms our theoretical predictions. If apocope had not rendered devoicing opaque, we would have to conclude that Early Modern German schwa apocope was an instance of *rule insertion* (King 1969). However, the structural description of neither apocope nor devoicing leads us to expect insertion (King 1973). Instead, Modern German final devoicing appears to be an instance of rule *re-affirmation* (Hock 1991), which entails that the devoicing rule, though opaque, remained productive in some dialects.

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1   Loss of devoicing in Early Modern German

Final devoicing has been heavily studied from a synchronic perspective, using many

different theoretical frameworks, both in German itself (e.g. Wiese 1996, Brockhaus

1995, Jessen 1997, Féry 1999, Iverson & Salmons 2007) and cross-linguistically

(Mascaró & Wetzels 2001). Diachronically, the cross-linguistic origins of final devoicing

have been extensively studied in Blevins 2004 as providing good evidence for an

"evolutionary" approach to phonology.

However, less theoretical work has been done on the development of the final

devoicing rule in Early Modern and Modern German, when the language was undergoing

significant changes that would potentially have affected the application of devoicing, in

particular, what effect the apocope of final unstressed vowels should have had. The

present discussion aims to elucidate the problem, provide some tentative solutions and

point the way to further research.

1.1   Description and origin of German final devoicing

1.1.1   Synchronic description of German final devoicing

Synchronically, German final devoicing can be characterized as follows (Wiese

1996:201):

(1) Final devoicing

$$[+\text{obstruent}] \rightarrow [-\text{voice}] / \text{—}]_\sigma$$

Examples include (Wiese 1996:200):

(2) 'praise' *Lo[p] ~ Lo[b]es*

'wheel' *Ra[t] ~ Ra[d]es*

'coffin' *Sar[k] ~ Sär[g]e*

'active' *akti[f] ~ akti[v]e*

'grass' *Gra[s] ~ Grä[z]er*

'orange (adj)' *oran[ʃ]* ~ 'orange (noun)' *Oran[ʒ]e*

As you can see, the rule applies only to obstruents, i.e. stops and fricatives (cf. Icelandic, where devoicing also applies to sonorants). The environment, moreover, is the syllable edge, rather than the word edge *per se*[1] (Vennemann 1972); nevertheless, the traditional, though ambiguous term "final devoicing" will be retained for the sake of familiarity.

Syllabification applies cyclically in German morphology, up until the word-level cycle, after which there is no re-syllabification (Rubach 1990, Wiese 1996:49-56). Hence, word-final obstruents are necessarily also syllable-final, even if the following word is vowel-initial. At the same time, syllable boundaries within the word trigger devoicing, e.g. *A[p]teilung*, within underlying prefix /ab+/.

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[1] Wiese goes on to revise the formulation of the rule in terms of autosegmental representations, and the choice between syllable coda and syllable edge as environment, but this is not relevant to our discussion.

But devoicing can also occur within words even where the obstruent could be syllabified as an onset, e.g. /ab+/ in *A[p]laut*, 'apophony', but *[b]lau* 'blue'. In such cases, we see that resyllabification does not occur across certain morphological boundaries within the word. For details, see Wiese 1996, who argues that such compound elements and derivational affixes are in fact phonological words for the purposes of syllabification.

By contrast, there are cases like *hab' ich* 'I have', where the final underlying /ə/ of the first word has been deleted by a postlexical rule. The final underlying /b/ may surface as voiced [b] in this context, although it varies with [p]. This does not constitute a true exception to the devoicing rule, however, since this only shows that the following enclitic pronoun *ich* may be optionally included in the same phonological word as the verb *hab(e)*, which is expected behavior for clitics: i.e. the syllabification is (ha)(bɪç), from underlying /haːbə/ + /ɪx/. If the two make up one prosodic word, then we expect normal word-internal syllabification to apply, i.e. the /b/ will be treated as an onset, and devoicing will regularly fail to apply.

Wiese 1996 points out that some consider the German laryngeal opposition to involve not voicing, i.e. the [voice] feature, but tensing (Kloeke 1982, and recently Iverson & Salmons 2007). Indeed, traditional German linguists have labeled the voicing alternation as one of 'tense' versus 'lax', or 'fortis' versus 'lenis'. The debate between these two analyses lies beyond the scope of this discussion, however, because all we will be concerned with is the fact that there is *some* kind of rule-governed laryngeal feature alternation in German. Which feature we use to describe that opposition is not important

for our purposes, so we will continue to use the popular label among English-language phonologists, i.e. devoicing.

1.1.2 Contemporary regional variation in final devoicing

Mihm 2004 notes that final devoicing in Modern German is only characteristic of northern pronunciation, which happens to be the basis for the standard pronunciation (Siebs 1957). Theoretical discussions about final devoicing reflect this northern-based standard pronunciation, rather than the central and southern varieties, which typically do not show devoicing in final position. This is due to a sound change that took place in most of the High German areas in the Early Modern period, known as "inner High German lenition", or *binnenhochdeutsche Konsonantenschwächung* (cf. Keller 1978:407). In the leniting regions, there is no voicing contrast in either medial or final position, but both series have been merged in a single, voiceless lax series: thus, in Rhine Franconian, standard Modern German *lei[t]en* 'to lead' rhymes with *lei[d]en* 'to suffer', with a [d] in both cases (Keller 1961, Mihm 2004). A contrast is usually retained in initial position, but this is not relevant to the discussion because initial consonants never alternate with final consonants.

According to Mihm, the Central German leniting pronunciation was the standard until the 19th century, when the speech of the northern cities of Berlin, Hannover and Hamburg, where both the voicing contrast and final devoicing had been preserved, became the basis for the new received pronunciation. This fact will play an important role in the discussion of the development of final devoicing in Early Modern German.

1.1.3   Origins of final devoicing in Middle German

The written evidence shows that the devoicing rule began to affect some obstruents

earlier than others (Paul 2007:131-3). The change begins with coronal stops, with the

change more or less complete by the beginning of the Middle German period (ca. 1100):

Old German *kleid* > *kleit* 'cloth'. By that time also the velar stops have become devoiced

in final position, at least in Bavarian texts, and later in other regions: *tag* > *tac/tach*

'day'[2]. The labial stops were apparently the last to undergo devoicing: *kalb* > *kalp* 'calf'.

However, although the origin of the devoicing rule possibly lies in several sound changes

operating in chronological series, the final result was a single devoicing rule affecting all

word-final voiced stops[3].

Fricatives came to participate in the devoicing rule by a different route. In Old

High German, all fricatives were apparently voiceless, whether in final or non-final

position[4]. In the Middle German period, however, word-internal fricatives, when

preceded and followed by a [–obstruent] segment (i.e. a sonorant consonant, a glide or a

vowel), became voiced: *hofe* > *hove* 'court', *hûse* > *hû[z]e* 'house'[5], both dative singular.

Although the change that gave rise to the fricative voicing alternation in Middle German

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[2] The final <c> represents [k], and the final <ch> the affricate [kx], since in some southern dialects, especially Middle Bavarian, final [k] from any source appears to have undergone affrication.
[3] This would be a case of rule "simplification" (King 1969): several phonological rules arising from several independent changes may be re-analyzed as a single rule, if such a re-analysis simplifies the grammar while remaining descriptively adequate.
[4] In some Old Central Franconian texts, we may have evidence for a voiced [ð] (from underlying /θ/), written <th> or <dh>, but by the end of the Old High German period this fricative had merged with the stop [d], and subsequently participated in the devoicing rule along with the other stops.
[5] Philologists debate over whether [z] was orthographically distinguished from [s] at all in Middle German; many handbooks use a special symbol to indicate the voiced sound, but it has doubtful textual support (see discussion in Paul 2007).

was properly speaking a voicing rule, we assume that the alternation between medial voiced and final voiceless fricatives was subsumed under the devoicing rule already governing stop alternations, giving the obstruent devoicing rule as described in standard Middle German grammars (Wright 1907, Paul 2007)[6].

This Middle German devoicing rule appears to have had the same structural description as the Modern German rule. This includes the conditioning by the syllable boundary, as seen in compound forms like *juncherre* 'gentleman' (Modern German *Junker*), from /jung/ 'young' + /herrə/ 'lord', cf. *junc*, but inflected *junger* (cf. fn. 2). As in Modern German, the devoicing rule was probably transparent[7]. While there has always been some variability in the spelling, the medieval writing system on the whole represents devoicing consistently enough that historical linguists have felt justified in assuming an exceptionless devoicing rule for Middle German[8].

Unlike Modern German, Middle German clearly distinguished between alternating final voiceless and medial voiced stops: e.g. nominative singular *tac* against nominative plural *tag+e*. This is despite the fact that both the final [k] of the singular and the stem-final [g] of the plural correspond to an underlying /g/. This indicates that Middle German spelling used a classical phonemic system, i.e. most or all surface contrasts were orthographically represented. By contrast, Modern German spelling uses a

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[6] In Early Modern German, all /v/ reverted to /f/ by a later devoicing rule, and soon after /w/ became /v/. This is why there are words using the old <v> spelling for /f/, e.g. *Volk, Vater*. Voiced /z/, as in *hûs* /huːz/ 'house', Modern German /haʊz/ *Haus*, did not revert to /s/, however, but remained distinct.

[7] Paul 2007 notes that there may be exceptions to final devoicing in Middle German where the word-final underlying voiced obstruent is followed by a vowel-initial clitic, e.g. *neig er* 'he leaned'. See above for a similar case from Modern German.

[8] The spelling represents the alternations in stops and the fricative /v/ quite consistently. The fricative [z], on the other hand, as in *hûs ~ hû[z]e*, was not so clearly distinguished from the voiceless counterpart [s].

"morphophonemic" or "morphemic" system, in which the underlying, not the surface

form is represented: thus, singular *Tag*, plural *Tage* (see below).

1.2   Loss of devoicing in Early Modern German

1.2.1   Loss of devoicing due to morphemic spelling

Modern German, unlike Middle German, does not represent final devoicing in the

spelling:

(3) Middle German   Modern German

    tac ~ tage   *Tag ~ Tage*

    wîp ~ wîber   *Weib ~ Weiber*

    eit ~ eit   *Eid ~ Eide* (with innovative *–e* plural)

The standard interpretation of the loss of final devoicing in Early Modern German can be

found in the classic reference grammars like Paul 1989[9] or Reichmann & Wegera 1993.

This theory holds that devoicing was never actually lost in German, but remained

automatic and transparent continuously from Middle German through to Modern

German. This account continues to be accepted by many historical phonologists working

on the development of final devoicing in German (e.g. Iverson & Salmons 2007).

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[9] The most recent edition of Paul's grammar of Middle German (Paul 2007) does mention the recent debate over the exact significance of the Early Modern German orthographic changes, without coming to any definite conclusions.

The changes in spelling from Old German to Middle German (see discussion on rise of Middle German devoicing) reveal that, rather than memorize the spellings of each word by rote, as we do much of the time in Modern English spelling, medieval German scribes applied general orthographic principles to the representation of their phonological system. Thus, when the phonological system changed so that [tag] was pronounced [tak], the spelling changed with it: *tag* > *tac*. By this logic, when *tac* began to be written *Tag* in Early Modern German, it is reasonable to suppose that this reflected a change in pronunciation from [tak] back to [tag].

However, the "standard" theory of the loss of Early Modern German devoicing (epitomized by the orthographic theories of Hermann Paul; see Mihm 2004:134-140) holds that this particular orthographic change had nothing whatsoever to do with the loss or retention of the devoicing rule. Rather, it represented a new orthographic *principle* that gained ground in the Early Modern period, which we call the "morphemic" principle (*das morphematische* or *morphologische Schreibprinzip*).

According to the standard theory, Middle German spelling was governed by the so-called "phonemic" principle, which was the principle that the spelling should distinguish between surface contrastive elements, i.e. phonemes, but should not represent more abstract distinctions, i.e. "morphophonemes", or, in generative terms, underlying representations. Thus, since /k/ and /g/ contrasted in Middle German (e.g. either sound can occur between vowels), the spelling should have distinguished between the two sounds, wherever they occurred on the surface. In the alternation between singular [tak] and plural [tagə], the stem-final obstruent, which is /g/ in medial position, becomes /k/ in final position. Although in final position the contrast is always neutralized, nevertheless

the /k/ phoneme must be written in this position since the contrast obtains elsewhere in the lexicon[10].

The standard theory considers the loss of written devoicing to be due to the increasing influence of the "morphemic" principle. In structuralist terms, whereas the *phonemic* structure of the singular of 'day' was /tak/, the *morphophonemic* structure was |tag|, because /tak/ and /tagǝ/ were alternating members of a single paradigm, and there was therefore a morphophonemic relationship between the phonemes /k/ and /g/. Morphemic writing represents this morphophonemic level of structure, rather than the phonemic level of the earlier stage of writing. Therefore the spelling represents the single morphophoneme |g| in both singular and plural, despite the phonemic neutralization in the singular.

Translated into generative terminology, we would say that the original system represented those sounds that are *distinctive* on the surface, i.e. that participate in binary oppositions, which are in turn determined by distinctive, binary features. Thus, [+voice] [g] is written *g*, but [-voice] [k] is written *k* (or *c*)[11]. The later, morphemic system represents only sounds that are distinctive in the *underlying* representation. We predict, in this case, that all automatic phonological rules that rewrite binary feature specifications

[10] Paul's orthographic theories were based in turn on concepts from pre-structuralist historical linguistics, in which one recognized that alphabetic systems are originally designed to represent actual pronunciation, but that the regular correspondence between the alphabet and the phonology breaks down with the action of sound change on the one hand, and the inherent conservatism of writing on the other.

[11] For the purposes of final devoicing, one expects surface contrast and distinctive oppositions to be represented in the same way, since final devoicing can be treated either as phonemic neutralization or neutralization of a feature opposition. There are some cases where the two theories make different predictions, however, e.g. where two allophones, i.e. sounds that are in complementary distribution and therefore not contrastive in structuralist terms, may nevertheless be distinguished by a binary feature opposition, e.g. in Old English medial /h/ and final /x/ are featurally distinctive but in complementary distribution. Phonemic writing should not be able to represent such a distinction, but distinctive feature-based writing should. This author believes that the evidence in fact supports the idea that pre-modern alphabetic writing is based on feature oppositions, which is fortunate because the author also believes in distinctive feature theory, not structuralist phonemic theory. For some cases, see Elmentaler 2003, in the excursus on allophonic writing.

will be "undone" for the purposes of orthographic representation. Hence, representation of surface [tak] as *tac* will be replaced by representation of underlying /tag/ as *Tag*.

1.2.2 Problems with Paul's theory

We can certainly explain how such an orthographic shift, once begun, could have rapidly spread throughout the German-speaking region. As German gained prestige in the late Middle Ages, the notion of "correct" orthography and a standard literary dialect gradually developed. Therefore, we begin to see, especially from the mid-16th century on (i.e. the Reformation and Counter-reformation) a rapid standardization of the written language (Keller 1978, Reichmann & Wegera 1993). These developments predict a tendency to increasing uniformity of spelling in the face of continuing phonological variation and change. Once the morphemic principle becomes established in the region where the most prestigious German variety is used, it is easy to explain how the rest of the German-speaking lands would adopt this writing system, regardless of their native dialect.

But what motivates the introduction of this new orthographic principle in the first place? Paul's theory of the development of writing was based on quite true observations, which were that alphabetic systems do tend over time to shift from representing surface representations to representing underlying representations (and in turn from underlying representations to stylized, phonologically arbitrary representations of the whole word or morpheme). However, the question is: do these systems change spontaneously, or are there any outside influences that trigger such changes?

We noted above that writing systems are inherently conservative. An untriggered change from a phonemic to a morphemic system would seem to violate this principle of orthographic conservatism, and the proponents of the "morphemic spelling" theory never explain why it is that the spelling system should have spontaneously shifted in this way. Therefore, we should look to see what other changes occurred in the language that might have caused the shift in spelling.

1.2.3   Contemporary attestations of loss of devoicing

We also have Early Modern German grammarians who commented on the phonological changes taking place in the language of their day. One particularly striking example is an East Franconian, Valentin Ickelsamer (Mihm 2004:180), who in his 1534 grammar (*Eine Teutsche Grammatica*) condemned the contemporary tendency to pronounce final /d/ and final /t/ both as <dt>, by which it appears he meant a voiceless lenis stop, such as we find in modern dialects that have undergone the inner High German lenition (see below on the *Augsburger Stadtbuch*).

As we will see the use of the digraph <dt> in late Early Modern German texts probably does not represent a re-assertion of final devoicing, since the older graph <t> should have sufficed to represent final fortis [t]. Rather, the digraph represents a new voiceless lenis sound that arose from lenition, which neutralized the contrast between /d/ and /t/ in all non-initial positions.

But whether or not <dt> represents a second devoicing or lenition, Ickelsamer's prescriptive pronunciation indicates that the received pronunciation of his day maintained

a voicing contrast in *both* medial *and* final position. While Mihm interprets this to mean that final devoicing in Middle German was not a true neutralization, our interpretation is that, after apocope occurred, devoicing was rendered opaque, and subsequently was lost, leading to leveling of the voiced alternant and an almost complete restoration of the voicing contrast as it had existed in pre-devoicing Old German. As we saw in the previous section, this process was mainly completed by the 16th century, the time at which Ickelsamer wrote his grammar.

Other similar evidence that supports the existence of a prestige, non-neutralizing, non-leniting dialect includes the prescriptions of Johann Christoph Gottsched (Mihm 2004:177), as expressed in his *Ausführliche Redekunst* (1748). Mihm considers his testimony to be evidence that the normative dialect, the so-called *meißnische Aussprachenorm* ("Meissnisch pronunciation norm", after the Upper Saxon capital region of Meissen), was a leniting dialect. Certainly, the other sources Mihm adduces support this, such as the rhyming schemes of early modern poets, who did not distinguish between /d/ and /t/, or the prescriptions of Goethe or Jakob Grimm (Mihm 2004:176-79). Gottsched's pronunciation rules stand out, however, because he was careful to distinguish lenis sounds like the final *g* in *Tag* from fortis sounds like *ch* in *Tach*, 'roof' (in East Central German, both were pronounced as fricatives). Thus, there appears to be some evidence that normative High German maintained a final contrast even as late as the 18th century[12].

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[12] In response to both the testimony of Ickelsamer and the testimony of Gottsched, it may be argued that these prescriptive grammarians were simply enjoining a spelling pronunciation. While this possibility cannot be logically excluded, it requires that we read such an interpretation into their criticisms of contemporary pronunciation. Ickelsamer and Gottsched did not say explicitly that a final contrast had to be maintained in pronunciation because it was maintained in the spelling; rather, the final contrast had to be pronounced because that was simply the correct pronunciation as they saw it. The testimony of Ickelsamer

1.3   Loss of devoicing through lenition

Mihm also demonstrated that the assumption that loss of devoicing in Early Modern

German was merely a change in spelling has by no means been universally held among

German philologists and historical linguists. On the contrary, he identifies two schools of

thought: a "northern" school, epitomized by Hermann Paul, which held that the loss of

devoicing was merely orthographic, and a "southern" school, which held that loss of

devoicing represented a phonological change. Since Paul and the northern school ended

up as the source for the standard grammars and handbooks of Middle German and Early

Modern German that most non-specialists refer to when discussing the historical

phonology of German, the northern school won out by a historical accident.

As it happened, the northern school members came from parts of Germany where

the spoken High German did in fact have a final devoicing rule, which pronunciation also

became the basis for the "stage pronunciation" (*Bühnenaussprache*), i.e. received

pronunciation, of the modern (19th century to present) standard, as codified in Siebs 1957.

The southern school members came from regions of Germany where the spoken standard

High German did *not* have a devoicing rule. This no doubt played a significant role in the

different interpretations of the Early Modern German changes[13].

The southern spoken variants typically show the so-called "inner High German

lenition" mentioned earlier, i.e. the unconditioned neutralization of voiced and voiceless

obstruents in *both* medial *and* final position. Since speakers from the south would not

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is probably more reliable, however, given the earlier date, and the fact that the pronunciation of Gottsched's
prestigious contemporary, Goethe, had neither final devoicing, nor an obstruent voicing contrast at all.
[13] We are speaking here of regional variations of the standard (*Umgangssprachen*), not true dialects.

have final devoicing for this reason, it makes sense that the southern school would be less inclined to believe in the unbroken continuity of devoicing from Middle German to Modern German.

Mihm in fact attributes the loss of devoicing in Early Modern German to this lenition, which the southern school originally did not do (Mihm 2004:135-7). Rather, many attributed the loss of devoicing to two factors: apocope of final schwa, e.g. *gabe > gab*, and leveling of alternations, e.g. *tac > tag* on the analogy of plural *tage*. The causal connection between the two was not discussed, except in some rare cases to be discussed below. Nevertheless, Mihm offers, as an original thesis, the idea that the loss of devoicing in Early Modern German was due to lenition.

His main evidence for this is the different rates at which devoicing was lost, according to the place of articulation of the final obstruents (Mihm 2004:153-165). The table below represents the complete statistics gathered by Ewald. The symbols in the curly brackets represent the Proto-West-Germanic correspondence, and the symbols in the angular brackets represent the use of voiceless graphs, i.e. devoicing. Sometimes more than one voiceless graph can be used to represent a voiceless segment, e.g. final [k] can be written <c>, <k>, or even <ch> or <kh>. Of course, the proportion of *spoken* devoicing may be much higher than that indicated in the spelling.

(4) Proportion of devoicing around 1500 (Mihm 2004 & Ewald 1997)[14]

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[14] {b} signifies West Germanic /b/, which was [b] medially and [p] finally in most High German, but in Central Franconian was [v] medially and [f] finally. {g} signifies West Germanic /g/, which was [g] medially and [k] finally, except in CF where it was [ɣ] medially and [x] finally. {þ, nd} signifies West Germanic /θ/ and /d/ after nasals, which was [d] medially and [t] finally in all dialects, including CF. {d} signifies West Germanic /d/ other than after nasals, which was [t] in all positions in most High German, except in CF where it was [d] medially and [t] finally.

	{b} = <f>	{g} = <ch>	{þ, nd} = <t>	{d} = <t>
Bonn 1547	100%	22%	58%	80%
	{b} = <p>	{g} = <k>	{þ, nd} = <t>	
Leipzig 1498	8%	6%	88%	
Bamberg 1507	2%	24%	58%	
Straßburg 1507	4%	2%	9%	
Basel 1497	33%	7%	25%	
Wessobrunn 1505	0%	2%	42%	

(Bonn = Central Franconian, Leipzig = East Central German, Bamberg = East Franconian, Straßburg = Low Alemannic, Basel = High Alemannic, Wessobrunn = Central Bavarian)

Thus, when we look at the relative numbers of voiceless graphs like *p, k, t* against voiced graphs like *b, g, d* in texts from about 1500 (Ewald 1997), we find that there is a much higher proportion of <t> over <d> in all the texts than of <k> over <g>. In the text from Basel, Switzerland, we happen to find a fairly large proportion of <p> over <b>, although elsewhere the proportion is much smaller, where we typically find more cases of <k> over <g> than of <p> over <b>, e.g. Bamberg. In the text from Bonn (Ripuarian or Middle Franconian), where final /b/ was phonologically [f], and written <f>, we find even more cases of <f> over <b> than of <t> over <d>.

Mihm considers this place-specific retraction of devoicing to indicate the action of sound change, i.e. inner High German lenition. This sound change affected most of what is called Upper German (Alemannic, East Franconian, Bavarian), with the exception of High Alemannic (Swiss) and South Bavarian (southern Austria, Tirol). Certainly, the context-specific nature of this retraction sits oddly with the idea that it only reflected a new morphemic spelling principle. Why would devoicing be lost at different rates according to phonological context, if the loss had nothing to do with phonology?

However, Mihm's lenition theory falls into difficulties. Firstly, lenition targeted both medial and final voiceless stops and fricatives, but his discussion focuses only on the retraction of devoicing in final stops. There is some evidence of lenition in medial position in Early Modern German texts, but overall the contrast was maintained in the literary language. The loss of devoicing, if truly phonological, does not represent unconditioned merger of the voicing contrast in favor of the voiced series, but rather an *undoing* of the contextual merger in final position, i.e. the contrast between voiced and voiceless stops was restored in final position, while in medial position it was never lost[15].

For example, Middle German *rat* could indicate either /raːt/ 'council', or /rad/ 'wheel', but their Modern German reflexes are written differently, as *Rat* and *Rad*, respectively, although in the standard northern pronunciation they both have final [t], while in the central, leniting regions they have a voiceless lax stop which can be represented as [d]. Yet Middle German distinguished the stop in *leiten* 'to lead' from that

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[15] This would appear to contradict Garde's Principle (Labov 1994), that mergers cannot be undone by linguistic means. However, later we will show in greater detail how contextual mergers can be undone by linguistic means.

in *lîden* /liːdən/ 'to suffer', and standard Modern German continues to do so: *leiten* versus

leiden, but in the leniting regions they are pronounced the same, i.e. voiceless [d].

Mihm acknowledges that the modern leniting varieties have merged the contrast

in medial position, and addresses this problem in a couple of footnotes (nn. 122, 123)

where he argues that Middle German devoicing in fact did *not* represent phonemic

neutralization! Instead, the writing of e.g. /tag/ as *tac*, or /toːd/ 'death' as *tôt*, Modern

German *Tod,* only indicated a kind of phonetic approximation. In other words, in final

position these voiced phonemes underwent a phonetic devoicing that did not involve a

merger with "true" voiceless phonemes, e.g. /t/ in *tôt* 'dead', Modern German *tot*.

This interpretation of the Middle German spelling is original but implausible.

Mihm is claiming that final devoicing in effect did not neutralize a binary [voice]

distinction, and yet scribes were conscious enough of the sub-featural phonetic distinction

to represent it graphically. This goes against the overwhelming evidence of other

phonemic writing systems, in which only *distinctive* phonological information is encoded

in the spelling (Rogers 1995). Mihm's evidence is based on certain interpretations of

some spellings in the Bonn Corpus texts, #111 and #133 (see next section), which are

unfortunately in some cases wrong analyses[16].

The second problem with Mihm's hypothesis is that he ignores the other possible

explanation for loss of devoicing: apocope of final schwa and leveling of alternations.

While he mentions this factor occasionally (e.g. p.173-4), interestingly he does not seem

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[16] The faulty analyses include an identification of *sankch* with the strong verb preterit *sank*, when in fact it is the noun *(vor)sang*, i.e. we are seeing the output of devoicing and *not* underlying final /k/. He does not notice that *anderwaid* is the output of apocope (Middle German *anderwaide*), and he seems to think that the noun *glid* cannot have been remodeled on the analogy of a related form, even though the plural of *glid* is *glider*. The idea is that if the final voiced obstruents of these forms could not be accounted for by leveling or apocope, the only explanation would be that the etymological voicing had been preserved throughout the period of Middle German "devoicing" (cf. fn. 60).

to notice the explanatory power of apocope with regard to loss of phonological devoicing[17].

The problem remains concerning the different ratios of voiced and voiceless graphs, according to the place of articulation. Since, as we have argued, Middle German devoicing affected *all* obstruents, the structural description of the rule should not have referred to place of articulation, i.e. the Middle German devoicing rule is assumed to have had the same description as the Modern German devoicing rule given on page 2. Therefore, when this rule was lost, for whatever reason, we expect the rule to disappear at the same rate in all stops. How does this square with the data from Ewald 1997?

Ewald's data comes from only one point in time. If we measure loss of devoicing over a longer period, however, we find that it *was* lost at the same rate in all contexts (Fruehwald, Gress-Wright & Wallenberg forthcoming). This suggests that the different ratios found in Ewald are not related to the loss of devoicing itself. While they may reflect some phonetic or phonological contextual effects that remain to be worked out, they do not alter the fact that final devoicing as a whole was lost at the same rate in all contexts, showing that a single phonological rule was being lost. If Mihm is right that these data represent various leniting sound changes, they should have proceeded at different rates[18].

1.4   Loss of devoicing through apocope

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[17] Mihm's interpretation of Middle German devoicing looks similar to recent attempts to describe modern German devoicing as "incomplete neutralization", which we will come to later on.

[18] The point here is not that place of articulation does not have *some* effect on the frequency of application of the rule in question, but that the different frequencies of application according to place of articulation are not evidence that there was not a single devoicing rule being lost.

Eberhard Kranzmayer in his survey of South Bavarian dialects (Kranzmayer 1956), which had not undergone the inner High German lenition, noticed that, among those dialects that had retained Middle German final schwa, final devoicing was also retained. Thus, you would find an alternation between nominative singular [tɒkˣ] and dative singular [tɒːgə]. On the other hand, dialects that had lost final schwa through apocope, so that the dative singular was now [tɒːg], had also lost devoicing (Kranzmayer 1956:79), so that the nominative singular was likewise [tɒːg].

Kranzmayer's own theory, which corresponds closely to the generative concepts of opacity and rule loss, was that in pre-apocope Bavarian (which includes a few contemporary dialects like parts of South Tirolian) the final schwa in the paradigmatic alternation between e.g. nom/acc singular [tɒkˣ][19] 'day' and dative singular [tɒːgə] (cf. Middle German *tac ~ tage*) in some way militated against analogical leveling (we would say that the alternation could be easily accounted for by a phonological rule of final devoicing). After apocope occurred, with the result that nom/acc [tɒkˣ] now alternated with dative and nom/acc/gen pl [tɒːg], analogical leveling was more likely, since speakers could no longer account for the voicing alternation by the presence of the schwa in the dative, i.e. the nom/acc singular form became [tɒːg] on the analogy of the dative. From this he inferred that the loss of final <e> led to the disappearance of final devoicing in late medieval Bavarian texts, e.g. *Perg*, 'mountain' (cf. Modern German *Berg*), from

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[19] In South Bavarian, devoiced final /g/ merged with former /kk/ to give the affricate [kˣ]. In High Alemannic, on the other hand, devoiced /g/ merged with former /gg/ to give [kk], while former /kk/ became [kˣ] as in Bavarian (Keller 1961).

older *perch*. Unlike Paul and the "northern" school, Kranzmayer saw the loss of written devoicing as evidence for loss of phonological devoicing.

Yet as we saw earlier in this section, historical linguists very rarely hit on apocope as the cause of the loss of devoicing in late Middle German and Early Modern German (to the extent they even believed devoicing *had* been lost). The main reason, of course, is that the modern standard pronunciation still *has* final devoicing, so, even if we accept that devoicing was lost, we still have to account for how devoicing "re-applied" to all the new inputs created by schwa apocope. In other words, how did dative singular *tage*, which now has no final vowel in informal spoken German, end up with final [k], and not final [g]? As Mihm noted, of course, most of the High German region underwent lenition, so we do not know for a fact whether devoicing actually re-applied everywhere. But with respect at least to the standard language, which maintains an underlying voicing contrast, we need to establish the relationship between apocope and this "second devoicing."

2   Loss of devoicing in Yiddish

2.1   Yiddish and German

Kranzmayer's hypothesis about the loss of devoicing in Bavarian, i.e. that it was caused by apocope of final schwa, recalls the work of Paul Kiparsky and Robert King on the role that opaque rule ordering had in triggering loss of devoicing in Yiddish (Kiparsky 1968, 1971, King 1980). However, whereas it has been until recently uncontroversial that

schwa apocope caused the loss of devoicing in Yiddish, it has yet to be established for German.

Both Yiddish and Modern German are generally agreed to descend from a common ancestor, Middle German (Weinreich 1980, Jacobs 2005, but cf. Wexler 2002). Like standard Modern German, Yiddish has a voicing contrast among obstruents; unlike German, Yiddish does not have final devoicing:

(5) German *Ta[k]*, Yiddish *to[g],* 'day'

German *Lan[t],* Yiddish *lan[d],* 'country'

German *Wei[p],* Yiddish *vay[b],* 'woman'

German *Brie[ff],* Yiddish *bri[v],* 'letter'

German *Hau[s],* Yiddish *hoy[z],* 'house'

but,

(6) German *Sa[k]*, Yiddish *za[k],* 'bag'

German *mi[t],* Yiddish *mi[t]*, 'with'

German *Sie[p]*, Yiddish *zi[p],* 'sieve' (but see below)

German *tie[ff],* Yiddish *ti[ff]*, 'deep'

German *gro[s]*, Yiddish *groy[s]* 'big'

The second set of examples shows that the existence of final voiced obstruents in Yiddish is not due to some final voicing rule (which would in any case be an unnatural sound

change). We also know that the final voiced obstruents in Yiddish are not due to the fact that devoicing simply never occurred in Yiddish, because of examples like *zip*, which was *sib* in Old German[20], or *avek* 'away', which was *in weg* in Old German. Both words had undergone devoicing in Middle German, i.e. before a separate Judeo-German dialect began to come into evidence (starting in the late 14th and early 15th centuries). King also shows that the earliest Judeo-German texts show devoicing. For example, a 1382 manuscript writes the final consonant of 'woman', /wi:b/, with the Hebrew character for a /p/, not a /b/. Therefore, the loss of devoicing must post-date the earliest attestations of Yiddish (King 1980: 374, 401).

2.2   Apocope and loss of devoicing in Yiddish

Starting in the 15th century, we see evidence of apocope of final vowels in Yiddish. Apocope was very regular, affecting all final schwa, with the apparent exception of the inflectional schwa found in attributive adjectives: *gut* 'good', *a gute man* 'a good man'. Leaving that aside for the moment, we see that Yiddish apocope was a regular sound change. This is important when we come to the discussion of rule addition.

The result of apocope was that all inflectional categories and word classes that were partly or wholly designated by final schwa had to be drastically re-analyzed. We

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[20] Final /p/ is exceedingly rare in Middle German, occurring only in recent borrowings from Latin or other languages with unshifted /p/. Proto-Germanic /p/ or /pp/ were shifted to fricatives or affricates in all non-initial positions in Upper High German. There are more instances in the German component of Yiddish, e.g. *kop* 'head', but etymologically this final /p/ is from Middle German geminate /pp/, which became /pf/ in Upper German, and from there passed into Modern German, hence *Kopf*. The retention of unshifted /p/ in Yiddish is an interesting example of the Central German component of Yiddish, which is otherwise largely Upper German in origin (Jacobs 2005). Modern Standard German, by contrast, has inherited much more from Central German.

can illustrate this using hypothetical post-apocope Middle German paradigms, since Middle German is more or the less the immediate ancestor of Yiddish, as it is of Modern German.

For example, the Middle German paradigms of /tag/ before and after apocope would be as follows (borrowed from King 1980):

(7)   Pre-apocope

	Sg	Pl
Nom	tak	tagə
Acc	tak	tagə
Gen	tagəs	tagə
Dat	tagə	tagən

Post-apocope

Nom	tak	tag
Acc	tak	tag
Gen	tagəs	tag
Dat	tag	tagən

Or consider the present and past indicative of the strong verb *geben* 'to give':

(8)   Pre-apocope

        Present   Past

                Sg   Pl   Sg   Pl

        1   gebe   geben   gap   gaben

        2   gipst   gebet   gæbe   gabet

        3   gipt   geben   gap   gaben

        Post-apocope

        1   geb   geben   gap   gaben

        2   gipst   gebet   gæb   gabet

        3   gipt   geben   gap   gaben

According to King, this situation brought about the eventual loss of the devoicing rule (owing to the opacity of the devoicing rule; cf. below). Forms like nominative singular [tak], derived from underlying /tag/, reverted to [tag]. In other words, the underlying [voice] specification of the obstruent was permitted to surface in an environment where previously it could not.

2.3   Loss of devoicing and paradigm leveling

The relative chronology according to Kiparsky, King and Kranzmayer, which dates paradigm leveling *after* apocope, overturned an older relative chronology (Sapir 1915, Sadock 1973, and recently again Albright 2008), according to which leveling *preceded* apocope:

(9)   Sapir/Sadock chronology

Middle German	tage	tak
Leveling	tage	tag
Apocope	tag	tag
Yiddish	teg	tog

(10)   Kiparsky/King chronology

Middle German	tage	tak
Apocope	tag	tak
Leveling	tag	tag
Yiddish	teg	tog

Not only the chronological order, but also the causal order was reversed. In the older view, the leveling of the voiced alternant to the singular paradigm was held to be the cause of loss of automatic devoicing, and hence the reason why the new final obstruents resulting from apocope did not become devoiced. Precisely why paradigm leveling would

have occurred at all, despite automatic devoicing, is unclear in Sapir's formulation, but nevertheless we have to consider leveling as a possible alternative explanation for the loss of devoicing.

One reason for preferring to treat loss of devoicing as true rule loss, rather than analogical leveling, is the following: King notes that Yiddish final voiced obstruents only turn up in alternating forms, e.g. Middle German *wëc ~ wëge* >–> Yiddish *veg ~ vegn*. Non-alternating forms, like *avek* 'away', ultimately from Old German *in weg* through Middle German *enwëc*, retain devoicing. In other words, restoration of final voiced obstruents does not occur every place where devoicing had applied historically, but only where the final voiceless obstruent was still derived synchronically from an underlying voiced obstruent. I.e. *enwëc* would now have underlying /k/ in the UR, /ənwɛk/, but *wëc* would still have /g/, i.e. /wɛg/, because there is evidence for underlying stem-final /g/ in the plural *wëg+e*.

If the loss of devoicing were the product of analogical leveling, we would not expect such a strong correlation between leveling of final voicing and synchronic derivation of devoicing. For example, since *avek* is similar in form to *veg* 'way', there is no reason for lexical analogy, which operates on the similarities between surface forms, to treat the two differently. The pattern makes perfect sense, however, once we start referring to underlying representations, but only a theory of synchronic derivations allows us to do that[21].

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[21] This argument follows Hock 1991, who demonstrates that this kind of "regular" analogy is impossible to predict under pre-generative assumptions, notwithstanding attempts to formalize principles of analogical change within the older tradition (e.g. Kurylowicz 1949).

The other reason to consider this a case of rule loss is that while non-alternating

forms resist loss of devoicing, by contrast almost all alternating forms fail to resist it.

That is, almost all underlying voiced obstruents now surfaced as voiced (with a handful

of exceptions, including *zip* mentioned above). If loss of devoicing were entirely the

product of lexical analogy, we would expect alternating forms like *tac ~ tag, wëc ~ weg*

to be about evenly split between paradigms that level the voiceless alternant, and those

that level the voiced alternant.

It is true that, as noted above, there are *some* paradigms where the voiceless

alternant is unexpectedly leveled: aside from *zip*, there is e.g. *hant ~ hent*, formerly *hant*

~ hende, cf. *land ~ lender*, from earlier *lant ~ lender*. King notes, however, that such

exceptions are almost entirely confined to stems ending in /nd/ in Middle German, and

that /nd/ stems where devoicing is lost, like *land*, all have Middle German plurals in *–er*,

not *–e*, i.e. they were unaffected by apocope. If we recall that in Old German, many of

these forms had /t/, e.g. *hant ~ henti,* it is conceivable that the voicing of /t/ after nasals

did not occur in Yiddish until after apocope. In any case, this group of exceptions is

defined by a common characteristic, and otherwise the loss of devoicing is

overwhelmingly regular, i.e. it did not follow a lexically arbitrary path, as we would

expect from simple analogy.

2.4   Opacity and loss of devoicing

The Middle German devoicing rule, as we noted, was transparent. That is, all members of

a paradigm where an underlying voiced obstruent surfaced finally, surface as voiceless,

with the result that devoicing was completely predictable according to the phonological environment: if an underlying voiced obstruent surfaces syllable-finally, it loses [voice]. Apocope, however, rendered devoicing *opaque*, i.e. it was no longer predictable according to phonological environment.

Phonological opacity is defined as follows (Kiparsky 1971, cf. Bakovic 2007):

- A rule A → B / C__D is opaque to the extent that there are surface representations
    - (i) of the form A in environment C__D, or
    - (ii) of the form B in environment other than C__D

According to Kiparsky and King, the non-predictability of a rule, i.e. its opacity, appears to have some causal relationship with the later loss of that rule.

Yet elucidating that relationship can be difficult. For instance, we cannot simply say that opacity prevented the devoicing rule from being acquired at all. Although the rule is no longer predictable on the surface in phonological terms, it might still be predictable in *morphological* terms, especially when we consider how the devoicing rule continues to apply productively in certain inflectional or derivational categories, or in certain morphological classes. This is what we call rule *morphologization*.

For example, devoicing would still apply in the nom/acc sing of certains nouns, the uninflected predicative forms of adjectives like *blint, blinder* 'tired', and the 1sg and 3sg past tense of strong verbs:

(11)   'day'   Sg   Pl

               Nom   tak   tag

               Acc   tak   tag

               Gen   tages tag

               Dat   tag   tagen

(12)   'to give', present and past indicative

       1   geb   geben   gap   gaben

       2   gipst gebet   gæb   gabet

       3   gipt   geben   gap   gaben

In the two paradigms above, we could argue for a continued devoicing rule, but one that

applies only in the nominative and accusative singular, or in the first and third person past

indicative. Because we can demonstrate that a devoicing rule of some description

continued in the language after apocope had occurred, we still have to specify what the

causal connection between apocope and loss of devoicing was, i.e. why nominative

singular [tak] was eventually replaced by [tag].

2.4.1   Opacity and markedness

One answer to this is that the apocope led to a marked *grammar*. When apocope

occurred, it was added to the grammar, after final devoicing in the derivational series:

(13)   UR   /tagə/ /tag/

            FD   --   tak

            Apocope   tag   --

            SR   [tag] [tak]

Note that in this grammar, final devoicing remains phonologically predictable. The only reason it is opaque is because another rule has been ordered after it in the derivation.

Assuming that learners would have no problem acquiring both phonological rules, what reason is there for them to alter the grammar by eliminating one of the rules? According to Kiparsky 1971, a grammar is marked if the rules are in counter-feeding or bleeding order. And the ordering of apocope after devoicing is indeed a counter-feeding ordering: that is, if apocope were instead ordered *before* devoicing, as in (13), then apocope would *feed* devoicing.

Kiparsky later revised his definition of grammatical markedness to say that a grammar is marked if it is opaque, i.e. if the rules are ordered in such a way that one of them is no longer predictable on the surface, as indicated in the definition of opacity given above. In either case, the (idealized) language learner repairs this marked situation by eliminating the opaque rule.

Of course, rule loss is not the only way to repair opacity. Another way is to re-order the rules so that they are in a transparent, feeding order:

(14)   UR   /tagə/ /tag/

Apocope	tag	--
FD	tak	tak
SR	[tak]	[tak]

Why should rule loss have been preferred to rule re-ordering in the case of Yiddish? There is no principle of synchronic grammar that would help us here. Rule loss is certainly inevitable wherever the simplicity criterion requires it. For example, if the outputs generated by a grammar after the addition of a rule can also be generated by a restructured grammar without that rule, then we expect restructuring and rule loss to occur (Halle 1962). But, as we saw above, apocope did not completely destroy the evidence for devoicing, but only rendered the evidence less transparent.

It is possible, though, that the choices of rule loss and rule re-ordering are not the only ones available to us. One option is to say that opacity led to irregular paradigms, which in turn triggered paradigm leveling, meaning that there was no actual rule loss taking place, but rather a radically different process, whose results just happen to appear to identical to the results of rule loss. Another option is to say that opacity led to a loss in the *productivity* of the devoicing rule, and that the rule's productivity is the factor predicting either loss or re-ordering. We shall deal with each in turn.

2.4.2   Loss of devoicing and paradigm uniformity

Albright 2008 has argued that the leveling of voicing alternations in Yiddish was due to paradigm pressure, which in OT can be handled by paradigm uniformity constraints. The

constraint in question is Base-Identity, which is violated if an output differs in some

respect from the "base" member of the paradigm, which in the case of Middle German

and Yiddish, was the stem-form of the plural /tag+e/.

The change involves promotion of Base-Identity above the markedness constraint

FinDevoi:

(15)   Middle German grammar

/tag/	FinDevoi	Base-Ident(/tag+PL/)	Ident-IO[vce]
tag	*!		
☞ tak		*	*

Yiddish grammar

/tag/	Base-Ident(/tag+PL/)	Ident-IO[vce]	FinDevoi
☞ tag			*
tak	*!	*	

The plural stem /tag+ə/ = [tagə], with the voiced obstruent, was selected as the

paradigmatic base by the learner, according to an independent learning principle

(expounded in Albright 2002) whereby the most phonologically "informative" member of

the paradigm is always selected as the base. The most phonologically informative member of a paradigm is the one in which the most underlying contrasts surface. Thus, in the case of the paradigm of /tag/, the most informative member is the one in which the underlying value for [voice] surfaces, i.e. the plural. By contrast, in the singular form /tag/ = [tak], the obstruent is in final position and the underlying [voice] cannot surface, so that it is less "informative" about the underlying representation.

But what motivates the promotion of base-identity? Base Identity is a kind of faithfulness constraint, so we expect it to be ranked below markedness in Universal Grammar (Kager 1999, Tesar & Smolensky 2000). Since promotion of Base-Identity results in a more marked grammar, we do not expect it to occur spontaneously[22]. The only thing that would actually prompt learners to promote this faithfulness constraint would be, as we expect, some other change that compels learner to deviate from the unmarked grammar.

That other change is, of course, apocope, which resulted in voicing alternations surfacing in final position that cannot be accounted for by a transparent final devoicing grammar. We represent apocope by the promotion of *FinalSchwa over MAX, and we prevent devoicing from applying by promoting Ident-IO[vce] over FinDevoi:

(16)   Post-apocope Middle German/Proto-Yiddish

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[22] This is assuming that spontaneous re-rankings are the primary cause of change. McMahon 2000a, however, showed that OT accounts of change frequently do not specify whether constraint re-rankings are the cause of change, or rather change, i.e. phonetic shift outside the phonological grammar, is the cause of the re-ranking. If the latter is true, then the explanation for the change will not lie in the framework of our phonological theory at all.

/tagə/	*FinSchwa	Ident-IO[vce]	FinDevoi	MAX
☞ tag			*	*
tagə	*!			
tak		*!		*
takə	*!	*		

By ranking FinDevoi below Ident-IO[vce], learners presumably no longer had reason to treat FinDevoi as an inviolable constraint, as it was in Middle German, and therefore the promotion of Base-Ident was made easier.

But even if we attempt to bypass the causal relationship between apocope and leveling of voicing alternations by appealing to paradigm pressure, we still need apocope to explain why devoicing ceased to be transparent and automatic, or why FinDevoi was demoted below Ident-IO[vce][23]. In particular, why should the promotion of *FinalSchwa over MAX, which results in apocope, lead to promotion of Ident-IO[vce] over FinDevoi, which results in loss of transparent devoicing?

2.4.2.1 Opacity and loss of devoicing in OT

The problem of capturing the causal relationship between apocope and opacity is linked to the wider problem of representing opacity in OT in general. Various solutions have been proposed for this, all of which rely in some way on stipulating formal mechanisms,

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[23] Albright himself admitted the inability of his analysis to explain the causal relationship between apocope and devoicing, which he sees is still necessary to explain the demotion of FinDevoi. Paradigm optimality, in other words, can only account for the leveling of voicing alternations, not the loss of obligatory, transparent final devoicing itself.

over and above ranked constraints, that allow the expression of synchronic opacity in a purely parallel system (the more well-known mechanisms include Output-Output correspondence, Sympathy, and interleaved or Stratal OT).

The most promising approach is Stratal or interleaved OT. In Stratal OT, each morphological level has its own constraint ranking, i.e. grammar. The output of the grammar at one level serves as the input to the grammar of the next level. Bermúdez-Otero & Hogg 2003 argued that Stratal OT could capture the opaque relationship between devoicing and apocope in Yiddish, provided that devoicing and apocope were ascribed to different morphological levels, i.e. devoicing to the word-level, and apocope to the phrase-level.

But in order for apocope not to feed devoicing, we must also suppose that Ident-IO[vce] outranked FinDevoi at the phrase level, as follows:

(17)   Middle German pre-apocope

Word-level

/tag/	FinDevoi	Ident-IO[vce]
tag	*!	
☞ tak		*

Phrase-level

35

/tak/	Ident-IO[vce]	FinDevoi
☞ tak		
tag	*!	*

(18)   Middle German/Proto-Yiddish post-apocope

Word-level

/tagə/	FinDevoi	MAX	Ident-IO[vce]	*FinSchwa
☞ tage				*
tag	*!	*		
take			*!	*
tak		*!	*	

Phrase-level

/tagə/	*FinSchwa	Ident-IO[vce]	FinDevoi	MAX
tage	*!			
☞ tag			*	*
take	*!	*		
tak		*!		*

However, it is not clear why Ident-IO[vce] should have outranked FinDevoi at the phrase-level in Middle German. One possible reason is that we are looking at the effect of *input optimization*, i.e. deviations from input-output identity were justified at the word-level because of alternations like /tagə/ ~ /tak/, but not at the phrase-level. The effect of input optimization can be illustrated by comparing stem-level and word-level grammars in Modern German:

(19)   Modern German

Stem-level

/tag+Sg/	Ident-IO[vce]	FinDevoi
☞ tag		*
tak	*!	

/tag+Pl/		
☞ tag		*
tak	*!	

Word-level

/tag+Ø/	FinDevoi	Ident-IO[vce]
tag	*!	

☞ tak			*

/tag+e/	FinDevoi	MAX	Ident-IO[vce]	*FinSchwa
☞ tage				*
tag	*!	*		
take			*!	*
tak		*!	*	

According to the principle of input optimization, at each level we assume learners start with the assumption of input-output identity, unless an alternation forces a deviation. So at the stem level, final /g/ in /tag/ is the correct output in all parts of the paradigm, which is why the plural is /tag+e/, not */tak+e/. But at the word level, where [tagə] alternates with [tak], this alternation forces a deviation from input-output identity, resulting in the higher ranking of FinDevoi. The output of the word level, [tak], then become the input to the phrase level, i.e. /tak/. Now, though, there are no alternations that force a deviation from input-output identity, so the learner continues to assume surface [tak] = /tak/.

Thus, the higher ranking of Ident-IO[vce] at the phrase-level is independently motivated by the learning principle of input optimization. When the apocope occurs, then, we do not need to suppose that Ident-IO[vce] was re-ranked at the same time as *FinSchwa. We do not need to appeal to an *ad hoc* mechanism like conjoined constraint re-ranking. On the other hand, we cannot fail to notice that the ability of Stratal OT to represent this kind of opacity in an elegant fashion derives from its mimicry of an ordered rule approach, i.e. with the use of intermediate representations.

Moreover, there is another criticism takes broader aim at the representation of change in OT, namely that the causal order of change and re-ranking is unclear (McMahon 2000a:97; cf. fn. 22). Does change cause re-ranking, or does re-ranking cause change? If the re-ranking of constraints causes the change, we have to explain why the constraints should ever be re-ranked. If, on the other hand, the changes represented here originate outside the phonology, then OT offers no explanatory advantage over rule-based phonology, and there is no particular reason for us to prefer OT over ordered rules.

One possible motivation for re-ranking is the tendency to replace marked grammars by unmarked ones. For example, if we assume that a completely unmarked grammar ranks markedness constraints over faithfulness constraints, we can motivate the change from Old German to Middle German quite easily, since it was in Middle German that the markedness constraint FinDevoi was promoted over the faithfulness constraint Ident-IO[vce].

The problem, of course, is that the demotion of FinDevoi in Yiddish goes in precisely the opposite direction, since in this case we have faithfulness being promoted over markedness. We have already explained how OT might handle the lower ranking of FinDevoi, namely through input optimization at the phrase-level. However, if the learner *starts* by assuming Markedness outranks Faithfulness, there is in fact no evidence at the phrase level for them to deviate from this ranking, either, because final devoicing in Middle German was true at both the word- and phrase-level. The result is that both input optimization and an unmarked grammar obtain at the phrase level:

(20)

Word-level

/tag/	FinDevoi	Ident-IO[vce]
tag	*!	
☞ tak		*

Phrase-level

/tak/	FinDevoi	Ident-IO[vce]
tag	*!	*
☞ tak		

This phrase-level ranking, of course, gives the wrong predictions for the output of

apocope:

/tagə/	*FinSchwa	FinDevoi	Ident-IO[vce]	MAX
tage	*!			
tag		*!		*
take	*!		*	
☞ tak			*	*

We can rank FinDevoi above Ident-IO[vce] only if we abandon the idea that learners

approach acquisition with completely unmarked grammars. This is possible if we assume

constraints are learned, rather than innate (Hayes 1999). In that case, we do not assume

learners start by assuming Markedness >> Faithfulness, but rather that they start by

assuming Faithfulness >> Markedness.

However, as soon as we adopt that approach, we can no longer *explain* change as

the product of constraint re-ranking: if a stable synchronic constraint ranking must be

learned, then a changing ranking must also be learned. We can certainly choose to

describe the changes in terms of constraint re-ranking, but the framework itself does not

offer any more explanatory value than a rule-based description.

2.4.3   Opacity and loss of rule productivity

We saw above that it was not enough to appeal to grammatical markedness to explain

rule loss, since rule re-ordering is an equally sufficient solution to the problem of marked

grammars. There must be some other aspect of the opaque ordering of final devoicing

and schwa apocope that brought about the loss of the devoicing rule. That aspect is

learnability.

As Kiparsky explains (Kiparsky 1971), opaque rules are *hard to learn*. Rules that

are hard to learn are, obviously, more prone to loss (see also Stampe 1979). If a rule has

many exceptions to its surface application, i.e. if it applies in environments where it is not

expected, or if it fails to apply in the expected environment, there is correspondingly less

evidence available to the learner that such a rule exists at all, and therefore the likelihood that the learner will fail to acquire the rule increases.

If we turn back to the post-apocope paradigms of /tag/ and /geben/ on pp. 21-22, we see that the outputs of apocope provide less evidence for final devoicing then the Middle German paradigms on p. 18. We already mentioned the fact that the irregular paradigms resulting from apocope would have triggered morphologization of the rule, i.e. the devoicing rule would now be interpreted as applying only in certain morphological categories. We assume that such morphologized rules are harder to learn (Kiparsky 1971).

As King notes, however, at some point the non-periphrastic past tense in Yiddish had been replaced by the periphrastic past (using the copula and past participle), so that much of the evidence for a devoicing rule would have been lost[24]: Middle German 'he gave', *er gap,* was replaced by *er hot gegebn*, 'he has given'. This means that the devoicing rule, which we have seen was already morphologized as a result of apocope, has ceased to apply in the past tense of strong verbs as well, with the result that there is correspondingly even less evidence available to the learner for a final devoicing rule.

Moreover, there is another likely trigger for the loss of devoicing, namely the effect apocope had in paradigms in which no members had ever undergone devoicing. E.g. the singular forms of *weak* nouns like *gabe* 'gift' > Yiddish *gob*, plural *gaben* > *gobn,* would not show devoicing in either singular or plural. Therefore, devoicing would have relatively many exceptions even within a particular inflectional category like

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[24] The chronological relationship between apocope, loss of devoicing and loss of the non-periphrastic past tense is unclear, however. Conceivably devoicing remained as an opaque rule for some time, and only the later loss of the non-periphrastic past triggered the complete loss of devoicing and consequent paradigm leveling. See discussion in King 1980:402.

"nominative singular", or in a particular word class, like "nouns". It would not be possible, that is, to account for nominative singular [tak] by a rule "devoice in the nominative singular", because then you would also get *[gap] from underlying /gab/. Instead, you would have to specify that devoicing apply only to *some* nominative singular forms, but not to others.

However, it is worth noting that the lack of evidence for synchronic devoicing, as a result of all the exceptions that accrue to devoicing from opacity, only obtains if the learner is unable to acquire synchronic apocope at the same time. As long as the learner has both rules in his or her grammar, then he or she will treat the exceptions to final devoicing as merely artifacts of the opaque rule ordering. We have to come up with a reason for learners to fail to acquire a synchronic apocope rule.

2.5   Productivity of devoicing and evidence for synchronic apocope

2.5.1   Apocope and restructuring of underlying representations

There is one good reason to suppose that learners failed to acquire synchronic apocope, and that is the fact that, after apocope occurred, there were no alternations between final schwa and zero, which would otherwise motivate a synchronic apocope rule (see e.g. Bermúdez-Otero 2006). In other words, after apocope occurs, learners are confronted with a paradigm like the following:

(21)   Sg   Pl

Nom	tak	tag
Acc	tak	tag
Gen	tagəs	tag
Dat	tag	tagən

There is no reason for them to know that the failure of devoicing to apply in the dative singular or the nominative/accusative/genitive plural has anything to do with a final schwa.

We can illustrate the problem with another example from Proto-Germanic, namely Grimm's Law (Hock 1991:251f.). This consisted of three changes:

(22) +stop > +fric / –obstr __
      –voice

e.g. *bʰrātēr* 'brother' > *brōþēr*, but *stā-* 'stand' >–> *stand-*

(23) +stop > –voice
      +voice

e.g. *gews-* 'taste' > *keus-* 'choose'

(24) +stop > +voice
      +asp   –asp

(±fric)

e.g. see 'brother' above, initial segment

In this way, Proto-Indo-European voiceless stops became voiceless fricatives, unless

preceded by an obstruent, voiced stops became voiceless stops, and voiced aspirated

stops became voiced unaspirated stops or fricatives (alternation between voiced stops and

fricatives was allophonic in Proto-Germanic; for details, see discussion in Ringe 2006).

Hock points out that only the first change results in a split, which can be

demonstrated by the example of the past participles of 'think' and 'save':

(25)   Pre-Proto-Germanic   tonk-tó-   nose-tó-

        Grimm's Law   θanx-tá-   nasi-θá-

By other changes we eventually get e.g. Gothic [θaːxta], [nasiða], and Old English

[θoːxte], [nerede]. At the period of development after Grimm's Law occurred, but before

the later changes occurred, the alternation between [ta] and [θa] forms of the participial

suffix would have motivated a synchronic rule analogous to Grimm's Law, i.e.

underlying /t/ should be spirantized (become a fricative), unless preceded by an obstruent

(such as [x]).

The other two changes did not result in splits: thus, Proto-Indo-European [g] became [k] in all environments[25], e.g. Proto-Indo-European /gews/ 'taste, choose' > Proto-Germanic /keus/. If no split results from a change, then there is no possibility of alternation between two conditioned outputs; rather we have a single, unconditioned output. Under these circumstances, we can speak of restructuring of the underlying representations of the sounds, as in the example of underlying Proto-Indo-European /gews/, which became underlying Proto-Germanic /keus/ directly.

Of course, we must now figure out how to reconcile the possibility of such "restructuring" changes, where no new synchronic rule has resulted from the change, and the equation of sound change with rule addition. One conceivable solution is to say that the change itself consists in the addition of a rule, whether unconditioned or conditioned, but that the restructuring of representations occurs subsequently, when the surface outputs are re-analyzed by the next generation of speakers.

With respect to Yiddish apocope, this means that the change itself, the innovation, consists in addition of synchronic apocope:

(26)   UR   /tagə/ /tag/

        FD   --   tak

        Apocope   tag   --

        SR   [tag]   [tak]

---

[25] The last change, the one that affected PIE voiced aspirates, did result in an allophonic split between voiced fricatives and stops; however, aspiration was lost across the board, so this feature of the corresponding Proto-Indo-European stop series no longer participated in alternations in Proto-Germanic.

However, because apocope does not result in synchronic alternations, this grammar is essentially unlearnable, since there is no evidence for a synchronic apocope. Therefore, restructuring of the grammar occurs, with simultaneous morphologization of devoicing:

(27) UR   /tag+PL/   /tag+SG/

      Devoicing   --   tak

We assume that the devoicing rule is sensitive to morphological features like [+plural]. Nevertheless, the morphological conditioning renders it harder to learn, and thus more liable to loss.

2.5.2   Apocope as a variable rule

The problem we now have to consider is this: if the grammar in (25) is unlearnable, how did it arise in the first place? To answer this, we must turn to the findings of variationist linguistics. As we know from studying sound change in progress, there is always a period of variation, when older forms that have not yet undergone the change alternate with forms that have undergone it (Labov 1994). This variation can be expressed as the operation of a variable rule (Labov, Weinreich & Herzog 1968). Variable rules, just like categorical rules, can be ordered, and so they readily fit into an ordered rule framework that allows for synchronic opacity (see also the discussion in Hock 1991, ch. 20)[26].

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[26] Hock also notes that Labovian variable rules are analogous to "optional" rules in generative theory. The difference is that classic generative phonology cannot predict when a rule will be optional or obligatory, with the result that new rules added to the grammar can theoretically be either. Labovian socio-historical linguistics, on the other hand, considers variable rules to be a necessary preliminary stage to categoriality;

If we apply the uniformitarian principle to the Yiddish problem, i.e. if we assume that apocope passed through a variable stage before becoming categorical, then we can justify the addition of a *variable* apocope rule that had been added to the end of the series of rules, namely *after* the devoicing rule. The variable rule would be synchronically justified because variants with and without final schwa would both be available to the learner: e.g. for a time, the plural of /tag/ would have two surface variants in competition, [tag] and [tagə]. Only upon completion of the change was the apocope rule lost, simultaneously replaced by the restructuring of underlying representations and morphologization of the devoicing rule.

2.5.2.1 Abstract final schwa

We should briefly address the possibility that an abstract final vowel still existed, even after apocope had eliminated it on the surface, since abstract segments have been proposed before to explain certain complex surface patterns (e.g. Brame 1972). This would solve the problem of how to justify a synchronic apocope rule when final schwa did not participate in any surface alternations. A case can be made for this analysis, if we allow that, at least temporarily, word-final voiced obstruents persisted in forms like plural [tag]. Since these would be rightly perceived as exceptions to final devoicing, it is quite conceivable that learners posited an abstract final vowel in order to account for the failure of devoicing to apply, i.e. the underlying representation would still be /tagə/.

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no rule enters the grammar as obligatory from the outset. Moreover, variable rules do not always become categorical; under some social conditions, they may remain variable indefinitely (Labov 2001).

One might object that, since the segment in question is abstract, the learner has no way of knowing whether it is a schwa, rather than some other segment. However, if we consider final devoicing to be conditioned by the syllable-edge, and since only a final vowel would trigger re-syllabification of the final obstruent into onset position, bleeding devoicing, it stands to reason that the learner would posit an abstract vowel, not a consonant. This vowel, moreover, would most likely be unspecified as to place of articulation, making it a schwa rather than any full vowel.

The main objection to the analysis with an abstract vowel is that the subsequent loss of the devoicing rule cannot be explained. If learners are still able to represent the plural of /tag/, /tagə/, with a final schwa, then the absence of final schwa on the surface continues to be motivated by a synchronic apocope rule. And if learners are still acquiring synchronic apocope, then the devoicing rule will not have acquired true exceptions, nor will it have undergone morphologization. And if the devoicing rule is still phonologically predictable, then it should not be liable to loss. Therefore, the eventual loss of devoicing argues against an analysis with abstract final schwa following apocope.

3   Apocope and loss of devoicing in Early Modern German

Apocope also affected Early Modern German, so we predict that the same thing would have happened here as in Yiddish: apocope would have rendered final devoicing opaque, leading to the eventual loss of the devoicing rule. This is indeed what Kranzmayer concluded from the loss of devoicing in Early Modern German texts. However, we also have to account for the fact that Modern German has final devoicing, and we will

consider the possibility that the presence of devoicing in Modern German is due to the different way apocope developed in German as opposed to Yiddish.

3.1 Middle German apocope

The process began in the Middle German period (1100-1400), when final unstressed vowels, i.e. the schwa [ə], written *e* in the texts, began to disappear in the written record. The conditioning was originally phonological, indicating it was a sound change, or perhaps several sound changes (Wright 1907:77f.):

- After *l* and *r* in disyllables with short stems: *are > ar, wole > wol*

- After *l* and *r* in trisyllabic and polysyllabic forms with long stems: *blindere > blinder*

- After nasals in the final syllable of trisyllabic forms with long stems: *blindeme > blindem*

- In the unstressed forms of disyllables: *ane > an, obe > ob* (both prepositions)

The term 'stem' in traditional Middle German grammar indicates the shape of the morphological root syllable, which were in most cases also the syllables of primary stress. Short or light syllables contained short vowels and no coda consonant, i.e. CV; long or heavy syllables contained long vowels, diphthongs, or coda consonants, i.e. CVV or CVC.

The metrical conditioning appears to be the elimination of the unstressed vowel where it represents the second mora of a trochaic foot, probably with the mora re-assigned to the preceding sonorant consonant: $((ar)_\mu(e)_\mu)_{Ft} > (ar)_{\mu\mu}$. Whether or not it is possible to subsume all of the Middle German changes into a single phonological statement is not relevant at the moment, although it appears that in three out of the four items some kind of sonorant schwa assimilation is responsible. Also, the syllable preceding the deleted vowel was always unstressed itself at this early stage.

In fact, Wright does not treat apocope (deletion of final vowels), and syncope (deletion of word-medial vowels) separately, but attempts to formulate rules governing all cases of schwa deletion, in contrast to other treatments (e.g. Reichmann & Wegera 1993), as follows:

(28)   Middle German apocope and syncope of schwa

After liquids, /l, r/, in disyllables with short stems:

are > *ar* 'eagle', but *name* > *name* 'name'
wole > *wol* 'well' (adverb)

After liquids in polysyllables with *long* stems:

blindere > *blinder* 'blind' (genitive plural)
engele > *engel* 'angels' (nominative plural)

wandelete > wandelte 'he changed'

After nasals, /m, n/, in polysyllables with long stems:

blindeme > blindem 'blind' (dative singular)

gevangene > gevangen 'prisoner'

After nasals in short stem forms before following *t*:

nëmet 'you (pl.) take' *> nëmt*

wonet > wont 'he dwells'

wonete > wonte 'he dwelt'

In unstressed disyllables:

ane > an 'on'

abe > ab 'off'

unde > und 'and'

Wright does not say how these five changes are chronologically ordered relative to each other, but it appears that the initial condition was preceding liquid if the syllable preceding the unstressed syllable was heavy. The moraic schema suggested above supports this:

(29) en.ge.le = ((én)$_{\mu\mu}$)$_{Ft}$ ((gé)$_\mu$(lè)$_\mu$)$_{Ft}$

na.ge.le = ((ná)$_\mu$(gè)$_\mu$)$_{Ft}$ ((lé)$_\mu$)$_{Ft}$

In *engele*, the final *e* is deleted since it falls on the weak branch of the second foot. In *nagele*, however, the final *e* is not on a weak branch, so it is not originally subject to apocope. Wright mentions that apocope was later analogically extended to this *e* as well, but it is not clear whether this is to do with a morphological or phonological re-analysis of the earlier apocope.

Apparently the environment was extended to preceding nasals, but only if the preceding syllable was unstressed. So we have *blíndeme > blíndem*, like *blíndere > blinder*, but *name* remains *name*, while *áre > ar*. With respect to preceding liquids, the schwa only needs to be in the weak branch of the foot; with respect to preceding nasals, however, the schwa needs to be in the weak branch of the foot, *and* the foot needs to be in the weak branch of the prosodic word. Adopting a hierarchical metrical structure as follows can capture this conditioning.

German metrical structure is left dominant, so we find that the schwa deleted is in the rightmost branch, i.e. the weakest metrical slot. The mora attached to the final syllable, *–me,* is re-attached to the preceding syllable, which is now *–dem*:

(30) PrWd
```
                    PrWd
                   /    \
               Foot      Foot
               / \       /  \
           Mora  Mora  Mora  Mora
              \  /        \   ⋮
             blind        de  me
```
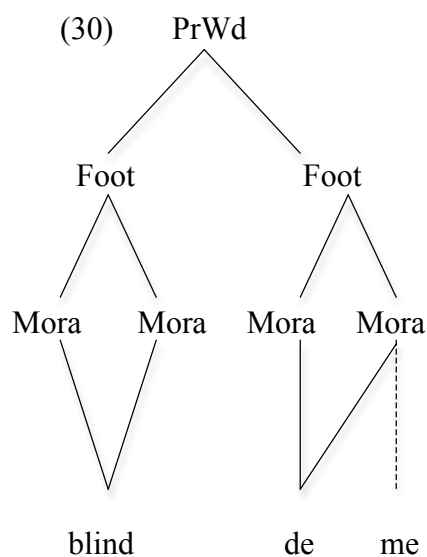
After the primary stressed syllable, as we saw, deletion of the schwa occurs if preceded by a liquid, but not a nasal. In unstressed words, on the other hand, apocope occurred even if the preceding segment was an obstruent: *abe > ab, unde > und*. Therefore, we should be justified in saying that, as schwa deletion was extended to the environment after the stressed syllable, at first the preceding segment had to be a liquid, i.e. where it had originally occurred after unstressed syllables; meanwhile, after unstressed syllables, the environment was extended to any segment. So the environment of the deletion rule was being extended in two directions, as it were.

There are two problems with this description. Examples like *wonete > wonte* show that sometimes deletion could occur after stressed syllables followed by nasals, *if* the *following* segment was /t/. This leads to the second problem, namely that the final vowel in the weak *preterit* suffix *–te* does not undergo apocope. Thus, we have *wandelete > wandelte*, not *wandelet.*

However, Keller 1978:406 shows that we have forms like *wandlen* alongside *wandeln*, and that apocope of schwa in *–te* did in fact occur. The almost universal existence of final schwa in Modern German *–te* is due to analogical restoration, or possibly dialect borrowing. As to why we find examples such as *wonet > wont* 'he dwells', but *name > name*, this again may have something to do with moraic structure. I.e. the final schwa in *name* is the sole mora-bearer in that syllable: $(na)_\mu(me)_\mu$, but in *wonet*, both the schwa and the following *t* can bear moras, meaning that the final *–et* could be considered heavy: $(wo)_\mu(net)_{\mu\mu}$. So if the change had been one of reducing syllable weight in unstressed syllables, then it would make sense to have $(wo)_\mu(net)_{\mu\mu}$ become $(wont)_{\mu\mu}$.

These tentative interpretations of this extremely complicated picture are only meant to develop the point that apocope was certainly in origin a phonologically driven process, even if at a later stage analogy and borrowing obscured the picture. This is an important thing to keep in mind especially when we come to the question of whether final devoicing applied to the outputs of apocope in Early Modern German.

3.2 Upper and West Central German apocope

The data reviewed by Wright 1907 focuses almost exclusively on apocope as it occurred in literary Early Modern German and Modern German. From the sixteenth century on, the most prestigious variety of German, the variety upon which Wright's grammar is based, was that of East Central German, i.e. Upper Saxony, Thuringia and later on

various former Low German-speaking northern cities that adopted East Central High German in the early modern period: Berlin, Hamburg etc (see Keller 1978, König 1978).

As it happens, it was mainly in the East Central German region that we find significant irregularities in the application of apocope, which we shall turn to later. In most of the southern, Upper German region, and also eventually in West Central German (Rhine Franconian and Central Franconian), apocope applied much more regularly. Not only that, but *earlier* texts from the East Central region show *more* apocope than later texts, indicating that the original Early Modern German apocope was much more obviously a unified, regular sound change, and that the phonological and morphological peculiarities found in later East Central German, as described in Wright 1907 and other standard sources, are the results of chronologically subsequent changes that obscured the regular patterns of the original change (see below).

The general patterns can be shown in the following table (from Lindgren 1953:178; Bav = Bavarian, EFranc = East Franconian, Swab = Swabian, HAlem = High Alemannic, LAlem = Low Alemannic, Boh = Bohemian, RhFr = Rhine Franconian, East Central German = East Central German):

(31)   Early Modern German apocope[27]

% -*e*	Bav	EFranc	Swab	HAlem	LAlem	Boh	RhFr	East Central

---

[27] The blanks in the East Central German (East Central German) column indicate the fact that apocope did not begin until around 1500, which is Lindgren's cut-off point. Similarly, the blank cells under Bohemian and Rhine Franconian indicate that frequency of final *e* reached 10% only after 1500 in these regions.

								German
90	1200	1300	1300	1325	1325	1350	1400	--
50	1275	1375	1375	1400	1425	1400	1425	--
10	1375	1425	1425	1425	1450	--	--	--

The leftmost column represents the percentage of *retention* of final schwa in forms where it should have occurred in (standardized) Middle German. The years indicate the mid-points of the corresponding period.

As we can see, apocope is first attested in Bavarian in the early 13th century, and had proceeded significantly by the late 13th century (Lindgren 1953:177f.). From then on, apocope appears to spread to neighboring regions. The blank cells indicate where retention of schwa had not yet declined to the respective percentage by 1500. Lindgren chose 1500 as the cut-off point because convergence of the various literary traditions began to take place in the 16th century, under the influence of the now prestigious East Central standard, which happened not to have undergone complete apocope by that time. For this reason, after about 1500 final schwa began to be restored in the literary dialect of most of these regions (although not in the spoken dialects).

One of the findings of Lindgren 1953 was that apocope in all these regions (except East Central German) proceeded in an unambiguously regular fashion, when the shift in percentages that are outlined in the table are represented graphically (Lindgren 1953:182-185). Lindgren measured the different percentages in retention of final schwa and grouped them by morphological category, in order to ascertain whether there were grammatical effects on the progress of the change. In fact, there were no significant

morphological effects until near the end of the change. Apocope proceeded at the same

rate in all categories, following a very clear S-shaped curve, which is the telltale sign of

any kind of regular grammatical change, including phonological change (see Kroch 1989,

Labov 1994).

Lindgren treated apocope after the liquids /r/ and /l/ separately, since he found, as

Wright did, that apocope occurred earlier in these environments. Unfortunately, he did

not also measure the rates of apocope according to position in the metrical structure. To

some extent, that is not important for our purposes, because he proved beyond a doubt

that Early Modern German apocope was a regular sound change. This is important to

remember when we come to discuss the relationship between sound change and addition

of phonological rules[28].

3.3   Interaction of final devoicing and schwa apocope in Early Modern German

3.3.1   The Bonn corpus

3.3.1.1 Methodology and data

The *Bonner Frühneuhochdeutschkorpus* (BFK) is a collection of Early Modern (1350-

1700) High German texts, produced by the University of Duisburg-Essen under the

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[28] Some grammatical conditioning appears towards the end, when the percentage of retention of final schwa
begins to rise again in inflected adjectives, but not in other grammatical classes. We certainly need to
explain how this can have happened, despite the Neogrammarian regularity hypothesis, but at the same
time, the restoration of schwa in inflected adjectives is clearly the anomalous, rather than the predominant
element in the picture. Therefore, we are justified in trying to explain the irregularities that we do see by
positing subsequent changes that may have restored schwa in those forms where it appears in the modern
language.

direction of Michael Elmentaler, in which words are individually tagged with their *lemmata* and relevant morphological information[29]. This allows us to compare attested word forms with expected forms, that is, what the Middle German and Early Modern German grammars tell us to expect for that word in that morphological category. Thus, the nominative plural of /tag/ should be *tage*; we then search for the nominative plural of *tag* in the corpus, and turn up the actual attested forms, which can vary from *tage* to *tag, tach, dag* and so on.

The texts are divided into ten dialect regions. It should be borne in mind that, in the context of Middle German, 'dialect' means regional variants of a partly standardized written language. Note that regional variants are not developments from, let alone "corruptions" of a formerly pristine and uniform literary standard, as scholars since the Grimm brothers have been wont to claim (Keller 1978:252-55, 370-80); rather, there never was an original literary standard. A standard did gradually emerge during the Middle Ages, becoming more or less codified during the sixteenth century. The standardization process was driven from below, following the gradual social, cultural and economic unification that gathered pace in the century immediately preceding the Reformation. Continued dialectal differentiation was due to the interference of the author's native dialect in the grammar of this prestige variety.

This prestige variety or dialect, at least with respect to its obstruent system, was based mainly on medieval East Franconian, a dialect that preserved the overall contrast between voiced and voiceless categories, but which neutralized this contrast in word-final position. There is little evidence for the effect of lenition in this variety (although see

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[29] The corpus is available for download at http://www.korpora.org/Fnhd. Not all the texts of the original corpus, compiled in the 1970s and 1980s, have been tagged, hence the peculiar numbering system you see below (111, 113, 115, 117, 121, 123, etc.).

discussion in Mihm 2004 on some of the evidence in the late Middle German period for lenition).

Nevertheless, despite this incipient standardization, there is *also* evidence for variation and change even in the written variety, at least during this pre-modern stage when spelling had not been rigidly codified. The greatest value to us is the insight offered into the extent of final neutralization on the one hand, and the loss of final schwa on the other, both of which are reflected in the spelling. The interpretation of the loss of devoicing is naturally more controversial, but in the following sections I will demonstrate that variation in the spelling of final neutralization does reflect phonological variation and change.

There are 40 texts in all, divided into ten sets of four each. Each set represents a particular dialect region, with the result that ten dialect regions of Early Modern German are represented in total. In each set, one text is selected from each of four periods: 1350-1400, 1450-1500, 1550-1600, and 1650-1700. The result is that the texts represent broadly equal intervals of 100 years for all dialect regions under consideration. In this subsection, I will present the resulting statistics by dialect area, and discuss the evidence they show for loss of devoicing in the next subsection.

The search consisted of comparing attested forms with the *lemmata* and relevant morphological tags[30]. If the lemma showed a stem-final voiced obstruent and the attested form showed the stem-final obstruent surfacing word-finally, that form was included in the analysis. All others, where the stem-final obstruent did not surface finally, were excluded. The selected forms were then divided according to whether the final obstruent

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[30] *Lemmata* consisted either of the underlying form of the stem for nouns and adjectives, so written *tac* would be tagged *tag*, or else the underlying form of the infinitive for verbs, so written *gap* (a past tense form of 'to give') would be tagged *geben*.

was written with a voiceless graph ('p, ph, f, t, th, k, kh, c, ch') or a voiced graph ('b, d, g, gh'); the results were labeled 'Devoiced' and 'Voiced', respectively[31]. These were then subdivided according to two categories: 'Apoc' (i.e. apocopated) and 'NoApoc' (i.e. non-apocopated), that is, where we expect the final zero to be due to apocope or not. The former category consists of the following:

- nouns whose lemma ends in zero:

    o dative singular and nominative/accusative/genitive plural of masculines

    o plurals of feminines

    o dative singular and genitive plural of neuters

- nouns whose lemma ends in schwa (*ja*-stems, *ō*-stems, and weak nouns)

- inflected adjectives

- verbs:

    o first person singular present indicative of strong and weak verbs

    o first/third person singular present subjunctive of strong, weak and preterit-present verbs

    o singular imperative of weak verbs

    o second person singular preterit indicative of strong verbs (excluding forms with innovative *–st* ending)

    o first/third person singular preterit subjunctive of strong verbs

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[31] I have restricted the search to stops, since fricatives were not as consistently marked for voicing in Middle German or Early Modern German, especially for the contrast between [z] and [s]. Also, there was a parallel *devoicing* of voiced [v] in Early Modern German that would have interfered with the alternation between medial [v] and final [f] (Keller 1978, Paul 2007). The terms 'Fort' and 'Voiced' stand literally for 'Fortition' and 'No Fortition', since fortition is another traditional term used for Middle German and Early Modern German devoicing.

- present participles

The latter category consists of the following:

- nouns whose lemma ends in zero:

    o nominative/accusative singular of masculines

    o singulars of feminines

    o nominative/accusative singular and plural of neuters

- uninflected adjectives

- verbs:

    o first/third person singular present indicative of preterit-present verbs

    o singular imperative of strong verbs

    o first/third person singular preterit indicative of strong verbs

Some unwanted forms might have been collected even with such fine-grained categories:

for instance, *ja*-stem adjectives like *müde* should have had final schwa even in

uninflected forms. However, the corpus tags them with schwa-less lemmata, so that I had

to treat them the same as *a*-stems like *blind*. Likewise, uninflected adjectives in Middle

German were frequently used instead of the strong inflected forms for masculine and

feminine nominative singular, or neuter nominative and accusative singular: so, *blint*

instead of *blinder, blindiu, blindez*. The corpus tags them as inflected, however.

Nevertheless, I did not treat these adjectival categories as non-apocopated because

the nominative singular of the *weak* adjective declension had final schwa in all genders

(*blinde*), and the corpus does not tag adjectives for strong or weak declension. Therefore, I included all inflected adjectives in the 'Apoc' category, and all uninflected in the 'NoApoc' category, with the hope that errors in each category would cancel each other out.

Similarly, nouns were not tagged for inflectional class, but for gender. In Middle German, paradigmatic differences within genders were being leveled out, but it is possible one would still find, for example, genitive and dative singular feminine *i*-stems with final schwa and umlaut of the stem-vowel, e.g. *hende*, rather than the innovative Modern German pattern, in which all singular categories are identical to the nominative singular (no schwa, no umlaut), e.g. *hant*. Nevertheless, I chose to treat all singular feminine nouns with schwa-less *lemmata* the same way, as non-apocopated, in order to facilitate the search.

The search took in only nouns, adjectives and verbs. There are a sizeable number of other words that originally had final schwa, namely the unstressed disyllables like *unde > und, abe > ab*, which include only prepositions, conjunctions or adverbs. Since these words had already lost final schwa in Middle German, their *lemmata* are given without schwa in the corpus. Interestingly, they never show final devoicing, which may be due to opacity, or else may have something to do with their lack of stress, which might correlate with lenition and hence voiced graphs. Whatever the explanation, they were not able to skew the results.

In Modern German, final schwa was in fact introduced into some categories in which it was not originally found even in Middle German: the nominative and accusative plural of neuter *a*-stem nouns is a good example. It is possible that this innovative final

schwa could then have been subject to phonological apocope. However, I chose to include all such categories in the non-apocopated group, since I was principally interested in the transition from Middle German to Modern German. In sum, in order to facilitate the gathering of data, I assumed a fairly standardized Middle German inflectional system, based on standard handbooks like Wright 1907 and Paul 2007.

After the raw numbers of each category were collected, the percentages of devoicing in the apocopated and non-apocopated categories were calculated, as well as the percentage of total devoicing. Then the raw numbers were subjected to a chi-squared test to see if the different proportions of devoicing in the two categories were significant. A p-value of less than 0.05 is generally considered significant.

What we hope to see is that devoicing should be significantly more frequent in words that did not have a final vowel originally, since that would correspond with our predictions: opaque ordering of apocope after devoicing would result in exceptions to devoicing only in those words that are the outputs of apocope, i.e. those words that formerly had final schwa. Of course, we also predict that such opacity would trigger rule loss and leveling of voiced obstruents throughout the paradigm, leading to complete disappearance of devoicing from the record. Nevertheless, there should be an intermediate period of lexicalized devoicing apparent in the texts in order to secure our case.

Middle Bavarian texts

Text no. 111

	Apoc	NoApoc	Total
Devoiced	19	42	61
Voiced	164	201	365
	10%	17%	14%

X-squared = 3.5095, df = 1, p-value = 0.06102

Text no. 113

	Apoc	NoApoc	Total
Devoiced	12	44	56
Voiced	252	263	515
	5%	14%	10%

X-squared = 14.2831, df = 1, p-value = 0.0001573

Text no. 115

	Apoc	NoApoc	Total
Devoiced	8	25	33
Voiced	106	243	349
	7%	9%	9%

X-squared = 0.2879, df = 1, p-value = 0.5915

Text no. 117

	Apoc	NoApoc	Total
Devoiced	0	0	0
Voiced	52	104	156
	0%	0%	0%

X-squared = Inf, df = 1, p-value < 2.2e-16 (Chi-squared approximation may be incorrect)

Swabian texts

Text no. 121

	Apoc	NoApoc	Total
Devoiced	4	83	87
Voiced	254	286	540
	2%	22%	14%

X-squared = 53.989, df = 1, p-value = 2.016e-13

Text no. 123

	Apoc	NoApoc	Total
Devoiced	5	24	29
Voiced	156	271	427

| | | 3% | 8% | | 6% |

X-squared = 3.6208, df = 1, p-value = 0.05706

Text no. 125

	Apoc	NoApoc	Total
Devoiced	11	11	22
Voiced	78	139	217
	12%	7%	9%

X-squared = 1.1406, df = 1, p-value = 0.2855

Text no. 127

	Apoc	NoApoc	Total
Devoiced	3	14	17
Voiced	130	247	377

	2%	5%	4%

X-squared = 1.3777, df = 1, p-value = 0.2405

East Franconian texts

Text no. 131

	Apoc	NoApoc	Total
Devoiced	5	112	117
Voiced	58	15	73
	8%	88%	62%

X-squared = 111.2651, df = 1, p-value < 2.2e-16

Text no. 133

	Apoc	NoApoc	Total

Devoiced	12	74	86
Voiced	148	155	303
	8%	32%	22%

X-squared = 32.2544, df = 1, p-value = 1.353e-08

Text no. 135

	Apoc	NoApoc	Total
Devoiced	0	6	6
Voiced	60	169	229
	0%	3%	3%

X-squared = 0.9579, df = 1, p-value = 0.3277 (Chi-squared approximation may be incorrect)

Text no. 137

	Apoc	NoApoc	Total
Devoiced	0	2	2
Voiced	71	260	331
	0%	1%	1%

X-squared = 0.0162, df = 1, p-value = 0.8986 (Chi-squared approximation may be incorrect)

Upper Saxon texts

Text no. 141

	Apoc	NoApoc	Total
Devoiced	7	175	182
Voiced	3	28	31
	70%	86%	85%

X-squared = 0.9207, df = 1, p-value = 0.3373 (Chi-squared approximation may be incorrect)

Text no. 143

	Apoc	NoApoc	Total
Devoiced	16	109	125
Voiced	48	153	201
	25%	42%	38%

X-squared = 5.3157, df = 1, p-value = 0.02113

Text no. 145

	Apoc	NoApoc	Total
Devoiced	1	7	8
Voiced	10	116	126

| | 9% | 6% | 6% |

X-squared = 0.0433, df = 1, p-value = 0.8351 (Chi-squared approximation may be incorrect)

Text no. 147

	Apoc	NoApoc	Total
Devoiced	0	2	2
Voiced	1	361	362
	0%	1%	1%

X-squared = 44.8747, df = 1, p-value = 2.101e-11 (Chi-squared approximation may be incorrect)

Ripuarian texts

Text no. 151

	Apoc	NoApoc	Total

Devoiced	11	153	164
Voiced	1	2	3
	92%	99%	98%

X-squared = 0.4117, df = 1, p-value = 0.5211 (Chi-squared approximation may be incorrect)

Text no. 153

	Apoc	NoApoc	Total
Devoiced	15	146	161
Voiced	5	31	36
	75%	82%	82%

X-squared = 0.2662, df = 1, p-value = 0.6059 (Chi-squared approximation may be incorrect)

Text no. 155

	Apoc	NoApoc	Total
Devoiced	10	40	50
Voiced	68	186	254
	13%	18%	16%

X-squared = 0.6807, df = 1, p-value = 0.4094

Text no. 157

	Apoc	NoApoc	Total
Devoiced	4	22	26
Voiced	144	366	510
	3%	6%	5%

X-squared = 1.4516, df = 1, p-value = 0.2283

East High Alemannic texts

Text no. 211

	Apoc	NoApoc	Total
Devoiced	2	101	103
Voiced	0	15	15
	100%	87%	87%

X-squared = 0.2769, df = 1, p-value = 0.5988 (Chi-squared approximation may be incorrect)

Text no. 213

	Apoc	NoApoc	Total
Devoiced	1	17	18
Voiced	97	154	251

	1%	10%		7%

X-squared = 6.5763, df = 1, p-value = 0.01033

Text no. 215

	Apoc	NoApoc	Total
Devoiced	0	3	3
Voiced	103	210	313
	0%	1%	1%

X-squared = 0.3498, df = 1, p-value = 0.5543 (Chi-squared approximation may be incorrect)

Text no. 217

	Apoc	NoApoc	Total
Devoiced	1	7	8

Voiced	33	202	235
	3%	3%	3%

X-squared = 0.1556, df = 1, p-value = 0.6932 (Chi-squared approximation may be incorrect)

East Swabian texts

Text no. 221

	Apoc	NoApoc	Total
Devoiced	1	20	21
Voiced	266	484	750
	0%	4%	3%

X-squared = 7.2053, df = 1, p-value = 0.007269

Text no. 223

	Apoc	NoApoc	Total
Devoiced	13	19	32
Voiced	148	313	461
	8%	6%	6%

X-squared = 0.6384, df = 1, p-value = 0.4243

Text no. 225

	Apoc	NoApoc	Total
Devoiced	8	12	20
Voiced	148	282	430
	5%	4%	4%

X-squared = 0.0742, df = 1, p-value = 0.7853

Text no. 227

	Apoc	NoApoc	Total
Devoiced	5	6	11
Voiced	239	285	524
	2%	2%	2%

X-squared = 0.0874, df = 1, p-value = 0.7676

Alsatian texts

Text no. 231

	Apoc	NoApoc	Total
Devoiced	1	162	163
Voiced	6	79	85
	14%	67%	66%

X-squared = 6.2746, df = 1, p-value = 0.01225 (Chi-squared approximation may be incorrect)

Text no. 233

	Apoc	NoApoc	Total
Devoiced	8	122	130
Voiced	298	320	618
	3%	28%	17%

X-squared = 76.8937, df = 1, p-value < 2.2e-16

Text no. 235

	Apoc	NoApoc	Total
Devoiced	12	25	37
Voiced	160	259	419

7%	9%	8%

X-squared = 0.2655, df = 1, p-value = 0.6064

Text no. 237

	Apoc	NoApoc	Total
Devoiced	2	14	16
Voiced	57	212	269
	3%	6%	6%

X-squared = 0.2661, df = 1, p-value = 0.6059 (Chi-squared approximation may be incorrect)

Hessian texts

Text no. 241

	Apoc	NoApoc	Total

Devoiced	4	63	67
Voiced	0	72	72
	100%	47%	48%

X-squared = 2.5475, df = 1, p-value = 0.1105 (Chi-squared approximation may be incorrect)

Text no. 243

	Apoc	NoApoc	Total
Devoiced	4	51	55
Voiced	27	91	118
	13%	36%	32%

X-squared = 5.1981, df = 1, p-value = 0.02261

Text no. 245

	Apoc	NoApoc	Total
Devoiced	40	73	113
Voiced	77	187	264
	34%	28%	30%

X-squared = 1.1593, df = 1, p-value = 0.2816

Text no. 247

	Apoc	NoApoc	Total
Devoiced	0	5	5
Voiced	51	297	348
	0%	2%	1%

X-squared = 0.0812, df = 1, p-value = 0.7757 (Chi-squared approximation may be incorrect)

Thuringian texts

Text no. 251

	Apoc	NoApoc	Total
Devoiced	3	84	87
Voiced	3	52	55
	50%	62%	61%

X-squared = 0.0227, df = 1, p-value = 0.8802 (Chi-squared approximation may be incorrect)

Text no. 253

	Apoc	NoApoc	Total
Devoiced	5	297	302
Voiced	0	55	55

| | | 100% | 84% | 85% |

X-squared = 0.1137, df = 1, p-value = 0.736 (Chi-squared approximation may be incorrect)

Text no. 255

	Apoc	NoApoc	Total
Devoiced	8	40	48
Voiced	27	373	400
	23%	10%	11%

X-squared = 4.5559, df = 1, p-value = 0.03280 (Chi-squared approximation may be incorrect)

Text no. 257

	Apoc	NoApoc	Total

Devoiced	0	6	6
Voiced	17	283	300
	0%	2%	2%

X-squared = 0.09, df = 1, p-value = 0.7642 (Chi-squared approximation may be incorrect)

3.3.1.2 Correlation between apocope and devoicing

The purpose of collecting these statistics was to see if a significant correlation between schwa apocope and frequency of final devoicing could be found. If none were found, we would have to conclude there was no solid evidence that the loss of devoicing in Early Modern German had anything to do with apocope, and that therefore the standard theory, that loss of devoicing was merely a spelling change, might be correct after all.

The results turned out far better than even this author suspected. Although not every text shows a significant correlation between devoicing and apocope, there are enough texts that do show it to suggest that Kranzmayer was right: the loss of final schwa did lead to the eventual loss of the devoicing rule in Early Modern German. We do find that in the sixteenth and seventeenth century texts (texts whose numbers end in 5 or 7), the correlation is generally non-existent, but this is to be expected because firstly, apocope had gone to completion by the late 16th century, and thus we predict that the loss

of devoicing and leveling of alternations would also occur by this time (devoicing overall applies at very low frequencies in these late texts); secondly, the later 16th century, as we saw, was a time of rapid convergence of written varieties, and any regional peculiarities in devoicing frequency would be expected to be leveled in favor of the prestige variety, which was apparently one that had lost devoicing, i.e. Upper German East Franconian

Starting with East Swabian (nos. 221-7), we find that in the very earliest text, although devoicing does appear to be close to disappearance, there is still a significantly greater devoicing rate in non-apocopated words, as we expect. In later texts, however, the correlation breaks down. The fact that correlation between apocope and devoicing was maintained longer in the Bavarian texts is probably accidental, owing to the choice of texts.

In the Swabian selection (nos. 121-7), there is unambiguously more frequent devoicing in non-apocopated words in the earliest text. In the second text the rate in non-apocopated words is higher, though less significant, and again in the last two texts the correlation disappears as devoicing vanishes across the board. So again, there is fairly strong evidence for the effect of apocope on devoicing in this region.

In East Franconian (nos. 131-7), we find *very* robust correlations of apocope and devoicing rates in the first two texts. At least according to the evidence of these authors, devoicing remained a robust rule overall through the 14th century (88% in non-apocopate words in no. 131). But as with the others, the 16th century saw a rapid decrease in overall devoicing, and the disappearance of any correlation between it and apocope.

The next two regions to undergo apocope, according to Lindgren (Lindgren 1953:208-10), were Upper (High) Alemannic, i.e. Swiss, and Bohemian. The latter is not

represented in our corpus, however, though High Alemannic is (nos. 211-7)[32]. Lindgren says that apocope was well advanced here by the turn of the 15th century, going to completion by the middle of that century. In our corpus, the earliest text actually shows so few apocopated tokens that the test could not return reliable estimations of significance. But in the second text, when apocope was well advanced, we find the expected correlation, with significantly more frequent devoicing in the non-apocopated category. By the third text, again we see the usual breakdown of the correlation.

The next region to undergo apocope was Low Alemannic, here represented by Alsatian (nos. 231-7). Here apocope reaches its mid-point and goes to completion a little bit later than in Swiss. As with our Swiss texts, the earliest text does not have enough apocopated tokens to guarantee an accurate test, but the second, 15th century text shows the expected correlation. As usual, the correlation falls apart in the 16th century as leveling of alternations and, later, dialect convergence takes place.

Next, apocope spread to Rhine Franconian, here represented by Hessian (nos. 241-7). Hessian actually represents the northeastern area of Rhine Franconian, which can be shown to have undergone apocope a little later than in the southwestern or Palatine area (see map in Lindgren 1953:209). Apocope would only have begun towards the middle of the 15th century here, reaching midway point in the early 16th century. Thus, our earliest text shows too few apocopated tokens to spot a correlation. But in the second text, from 1485, there is again significantly more devoicing in the non-apocopated

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[32] The corpus labels these texts *East* High Alemannic. The distinction is not made in Lindgren. Low Alemannic (Alsatian) has indeed heavily influenced the dialects of northwestern Switzerland (i.e. West High Alemannic, including Basel and environs) have indeed been heavily influenced, so that could explain the restriction to the northeastern region (Zürich and environs) here. The German dialects of southern Switzerland (so-called Highest Alemannic or Walserdütsch) have mostly preserved final vowels and the devoicing rule, rather like the southernmost Bavarian dialects of the Tirol (see subsection 2.3.1 and references).

category. Since apocope occurred so late here, however, we would expect to see some significant correlation even by the late 16th century, assuming that the loss of devoicing progressed at the same rate as in Upper German. The rapid disappearance of devoicing in text no. 245 is probably thus due to dialect shift rather than merely leveling.

Regular apocope then affected Middle Franconian, here represented by Ripuarian (nos. 151-7)[33]. Ripuarian actually represents the most northerly region of Middle Franconian; further north we come into Low Franconian, i.e. Dutch. Thus, apocope reached here the latest out of all the High German regions. This is reflected here by the fact that in both the 14th and 15th century texts, apocopated tokens are too few to guarantee an accurate test of significance. In the 16th and 17th century texts, on the other hand, where we might have expected to see some effect of apocope on devoicing, instead we find a sudden drop in the frequency of devoicing overall, and no correlation with apocope (which has also suddenly advanced). We are almost certainly looking at the effects of dialect shift here, especially since many other features of Ripuarian dialect have been lost at the same time (see next subsection).

Finally, apocope spread to the East Central German region, here represented by Thuringian and Upper Saxon. Thuringian (nos. 251-7) borders the East Franconian region so we can assume apocope spread to here first[34]. We find that in all our texts apocope has affected too few words to guarantee an accurate estimation of significance. The rapid

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[33] Middle Franconian is not included in Lindgren's statistical study, because apocope occurred so late here, but he does discuss it briefly on pp. 208-10.

[34] Lindgren does not distinguish between Thuringian and Upper Saxon, so we are going by the predictions of geography in this case, as with East Swabian and Swabian.

decrease in devoicing rate in text no. 255 cannot be due to apocope. As with Ripuarian, we are probably seeing dialect shift instead[35].

In Upper Saxon (nos. 141-7), we see a more interesting pattern. Although the earliest text has too few apocopated tokens, as we expect, by chance the second text has enough apocopated tokens to guarantee an accurate test for significance. By good fortune, we indeed find an expected higher rate of devoicing in non-apocopated words, even in a dialect region where we know apocope had highly irregular results. In the later texts we see the expected drop in devoicing, again probably owing to dialect shift. But in this region we have some crucial evidence that apocope affected devoicing in *all* regions where it occurred, whether or not other factors led to the restoration of final schwa at a later date.

3.3.2   The Augsburger Stadtbuch

Our findings from the Bonn corpus corroborate findings from an earlier study by Elvira Glaser (Glaser 1985:248-251). Her study was focused on four versions of one particular text, the *Augsburger Stadtbuch*, dated to 1276, 1373, 1483, and 1523. The lexical content of the text remains almost exactly the same in all four editions, with a few inconsequential differences in wording. The only major changes are in spelling. What is very significant for the historical phonologist of German is that the spelling changes clearly correlate with phonological changes, including apocope and loss of devoicing.

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[35] Text no. 255 may possibly show significantly greater devoicing in *apocopated* forms, which, if true, would be very strange. An examination of the actual word list reveals that these tokens all include the dative singular of /tod/, 'death', which was by this time conventionally written *Todt*, using the <dt> digraph. As we will see later, this digraph probably indicates the effect of inner German lenition, not devoicing.

Glaser's method was very similar to the one used to analyze the Bonn corpus. The actual spellings were compared with Middle German citation forms, such as *tac* 'day'. Glaser coined the term "meta-phonemic" to describe the phonological structure of the citation forms. To some extent this correlates with underlying representation, where, for example, the citation form represents a historically older form that may still be recoverable from alternations, such as the plural *tage*. The final "meta-phonemic" vowel could still be recovered where the form varied with apocopated *tag*. In other cases, the meta-phoneme does not reflect underlying representation, but a historically older surface representation, e.g. the final *c* in *tac*, where we suppose that even at the earliest stage the underlying obstruent was /g/.

Although Glaser did not make use of generative phonology, and hence of the opportunity to describe the changes in terms of shifting surface and underlying representations, she did distinguish between alternating and non-alternating phonemes. This was particularly useful in distinguishing word-final surface [t] deriving from underlying /t/, and surface [t] deriving from underlying /d/[36]. The result was a set of six alternating meta-phonemes: /b/, /d/, /g/, and /p/, /t/, /k/, which Glaser compared with their graphic representations, focusing only on word-final position. The former three represented those voiced stops that originally only surfaced medially, but after apocope could also surface finally; her restriction of the comparison to word-final position means that only apocopated forms were considered. The latter three represented those voiceless

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[36] Glaser considered most cases word-final underlying /k/ to involve geminate /kk/, i.e. phonemically distinct from [k] deriving from underlying /g/. Surface [p], on the other hand, could in theory reflect either underlying /b/ or /p/, but in reality examples of underlying /p/ were very rare. A geminate /tt/ did exist, but was restricted to medial position, where it contrasted with /t/ and /d/.

stops (deriving from etymological voiced stops) that were found originally in final position.

In post-vocalic final position (after apocope), /b/ was written *b* 90% of the time in 1276, 80% of the time in 1373, and in 1483 and 1523 100% of the time. Final /d/ is only attested from 1373, where it is written *d* 100% of the time; in 1483 it is also 100% *d*, but in 1523 it is only *d* about 45% of the time. Final /g/ is not attested in 1276, but is found as *g* 100% in 1373, 1483, and 1523. In post-consonantal position[37], we find /b/ as *b* 100% in all four texts; /d/ is *d* 0% in 1276, 85% in 1373, and about 90-95% in 1483 and 1523; finally, /g/ is *g* 0% in 1276, but 100% afterwards.

As for the original voiceless phonemes, alternating /p/ (from underlying /b/) in post-vocalic position is *b* 0% in 1276, 35-40% in 1373, and 100% in 1483 and 1523. Alternating /t/ is *d* 0% in 1276, 90% in 1373, 80-85% in 1483, and 10% in 1523. Alternating /k/ is *g* is about 25% in 1276, 80% in 1373, and 100% in 1483 and 1523. In post-consonantal position, /p/ is *b* 0% in 1276, and 100% afterwards; /t/ is *d* 0% in 1276, 10-15% in 1373, 70-75% in 1483, and 15% in 1523; while /k/ is 0% in 1276, 20% in 1373, 80% in 1483, and 60% in 1523.

Interpreted in generative terms, her statistics reveal that, at least in the earliest version of the text (1276), final underlying voiced obstruents in apocopated forms were much more likely to be written with voiced graphs than those in non-apocopated forms. In other words, exceptions to final devoicing were only found, for the most part, in cases where we predict such exceptions to have arisen from the opacifying effect of schwa

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[37] Glaser does not distinguish between obstruents and sonorants in her definition of post-consonantal, so that post-consonantal instances of devoicing may indicate either voicing assimilation (after voiceless obstruents) or final devoicing. However, since she only included voiceless stops that alternated with voiced ones, in practice post-consonantal could only include post-sonorant, since only after a sonorant would voiced and voiceless obstruents contrast.

apocope. In later texts, the significant correlation of exceptional final voicing and apocope is lost, as the voiced graphs are increasingly written for the underlying voiced stops in both apocopated and non-apocopated forms, i.e. we are seeing the effect of leveling, or loss of the devoicing rule. This strongly corroborates our findings from the Bonn Corpus: apocope leads to opacity or exceptions to the devoicing rule, which in turn leads to loss of the rule and leveling of alternations.

The major anomaly here, of course, is the behavior of the meta-phonemes /d/ and /t/, i.e. underlying /d/ (and to a much lesser extent, /g/ and /k/). Although the use of the voiced graph climbs dramatically in the second text (1373), we find a curious restoration of the voiceless *t* in the last two texts. For those who believe that Middle German devoicing survived into Early Modern German through apocope, this might be strong empirical confirmation of this hypothesis. Perhaps, after all, apocope did not cause the loss of devoicing, but only a temporary period of opacity, later corrected by re-assertion of the devoicing rule.

The problem with this hypothesis is that it only accounts for the re-assertion of final *t* for /d/; final *k* for /g/ is in fact only sparsely attested, while final *p* for /b/ is not attested at all. The re-assertion of the devoicing rule would thus be restricted to only one underlying voiced stop, namely /d/. Since the structural description of the original devoicing rule did not distinguish by place of articulation, but affected all three underlying stops more or less evenly, it is unlikely that we are looking at the re-assertion of the original devoicing rule. We need to find another way to explain this phenomenon.

It is here that perhaps Mihm's hypothesis about lenition has a part to play. Lenition was a true sound change, and therefore we would not be surprised if it

proceeded at different times and rates according to place of articulation. Although in those dialects where lenition took place, all three stops were lenited (Keller 1961), while the change was in progress it is plausible that we would see it affect one place of articulation before another.

Could the restoration of final *t* in fact represent the onset of lenition, restricted at that time to coronals? At first, this seems incorrect, since lenition should have replaced *t* by *d*, not *vice versa*. Nevertheless, a closer examination of these late instances of *t* reveal that in fact they reflect the new digraph *dt*, largely unknown in Middle German, but very common in Early Modern German. The use of a digraph strongly suggests that scribes and printers were attempting to represent a sound somewhere in between [d] and [t], which happens to match inner High German lenited [d] very well[38]. The use of occasional *gk* to write final /g/ also suggests the operation of lenition. The absence of **bp* might indicate that lenition had not yet spread to the labial series, and by the time it did, standardization of the spelling prevented any further innovations in orthography that might reflect ongoing phonological change[39].

Some additional strong evidence that *dt* represented the effect of lenition is where it was used to represent original underlying /t/, e.g. the genitive singular masculine *tôten*

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[38] Historical linguists of German generally hold that the medieval contrast involved a significant phonetic distinction between fortis (tense voiceless) and lenis (lax and probably voiceless). The amount of true voicing is debated (see discussion in Paul 2007), but was probably relatively insignificant, judging by southern dialects that preserve the distinction (e.g. Swiss). The inner High German lenition simply eliminated marked fortes in favor of the unmarked lenes, a process that for convenience we have been describing as merger in favor of the voiced series. See Iverson & Salmons 2007 and references for why lenition should not be described as voicing, although they identify fortis or tense articulation with aspiration, even though aspiration was probably not a salient feature of Middle German fortes (Paul 2007:121).

[39] The use of *dt* remained common through the Early Modern German period, being gradually eliminated in the 19th century, as *d* became the preferred graph for underlying /d/. At this point we can probably speak of a new morphemic principle of spelling, since, according to this author, it was in the 19th century that final devoicing was finally reintroduced into the standard literary language, owing to northern, Low German influence in the High German speech of cities like Berlin and Hamburg.

'dead', written as *toten, totten,* and *todten*. The accusative singular neuter *tôteʒ* in turn is written *totez, tottes, todes*, and *tods*. So we even find *d* for medial /t/! The only plausible explanation for the use of the voiced graph here is lenition of /t/ to [d]. Therefore, we are justified in attributing the innovative use of *dt,* not to re-assertion of devoicing, but to inner High German lenition[40].

3.4   Apocope and loss of devoicing in German dialects

We have found robust evidence in the textual data for the hypothesis that the loss of final devoicing in Early Modern German was a real phonological change, brought about by apocope of final schwa. Apocope resulted in many surface exceptions to devoicing, which in turn triggered the loss of the rule and eventual leveling of voicing alternations. However, it would be even more helpful if we could find evidence of this sequence of events in devoicing dialects that underwent apocope in recent times.

The best place to look, of course, is dialects in areas where apocope is still spreading. The maps given in the *DTV* atlas of the German language (König 1978:158f.) show the approximate borders of apocope around 1940[41]. There are in fact two regions of

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[40] Note that this evidence of lenition in our latest texts does *not* support Mihm's theory that the loss of devoicing in Early Modern German is due to lenition. The evidence of lenition only appears *after* apocope has largely gone to completion *and* devoicing has already been lost, and the correlation between apocope and exceptions to final devoicing is, as we saw, too robustly attested for our earlier texts to dismiss the apocope theory. In the earliest text, the voicing contrast still obtains, and the devoicing rule is still active, though it has gained some exceptions through apocope; in the second text, there are many more exceptions, and leveling of the voiced alternants has ensued; in the third, leveling of the alternations is mostly complete, but lenition is still incipient; in the final text, lenition has proceeded considerably in coronals, and has started to show in dorsals.

[41] Population movements after World War Two considerably disrupted the dialect situation. The eastern third of pre-war Germany was almost entirely stripped of its German-speaking population, and it is from precisely these areas (Silesia, Pomerania, East Prussia) that the dialectal evidence presented in this subsection is drawn.

apocope, one in the north, where Low German is spoken, and one comprising most of the southern High German area. The area where apocope did not occur comprises Silesia, Brandenburg and parts of southeastern Pomerania, northern Thuringia, most of Upper Saxony, Westphalia, Eastphalia, southern Lower Saxony and the regions bordering the northeastern Netherlands. As the maps indicate, the area of no apocope is shrinking, meaning that in those dialects straddling the border of the apocopating region, apocope is likely to be a recently introduced rule, and therefore will be likely to be opaquely ordered with respect to devoicing[42].

Of course, the range of dialect areas we might observe opaque devoicing will be more restricted than that, because of inner High German lenition, which neutralized the voicing contrast in all non-initial environments. Most of the dialects in the southern region where apocope occurred, i.e. Upper German and West Central German, have undergone this lenition. Therefore, even if at an earlier stage of the language apocope had caused the loss of devoicing, we cannot now recover the evidence for this, since the final voiced obstruents that would have surfaced finally owing to apocope are now indistinguishable from original voiceless obstruents.

Hence, we are compelled to look in only a few restricted areas where apocope has recently occurred, but where the original voicing contrast has also been maintained. One promising region is in the east, namely the northwestern border of Silesia, where on König's map we can see that apocope is advancing south from the Low German-speaking

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[42] In fact, the map also indicates discrepancies between apocope as it applies in uninflected words, like the predicative form of the adjective *müd(e)* 'tired', and inflected words like the dative singular *Haus(e)* 'house'. Apocope in some areas has affected the latter, but not the former. This may be evidence of morphologization of the apocope rule, but for the present argument the discrepancy is unimportant: the dialects we will be examining have all undergone regular, phonological apocope.

region[43]. And indeed, a survey of a local dialect (Messow 1965:15-20) reveals just what we expect: apocope has caused the lexicalization of the devoicing rule.

Since apocope has so recently occurred in this dialect (from the town of Züllichau and the surrounding region), the devoicing rule has not been lost completely. Thus, while the singular of 'day', Modern German *Ta[k]*, which never contained a final schwa, is [tak], the word for 'eye', which *did* have schwa (cf. Modern German *Au[g]e*), is [oːg]. The correlation between apocope and exceptions to devoicing is very strong, although there are some anomalies, e.g. the word for 'mountains' is [baːrk], cf. Modern German *Ber[g]e*. The latter might be caused by haphazard extension of the lexical devoicing rule on a word-by-word basis (see below for the discussion of a similar case in Finnish), or else plain lexical analogy.

That *some* kind of devoicing rule is still active in the phonology is shown by examples like the following: singular 'goose', Modern German *Gan[s]*, is [gɔns], but the *plural*, Modern German *Gän[z]e* with final vowel and umlaut, is [gɛnz][44]. This cannot be analyzed as a plural *voicing* rule, because we also have [ʃtʊk] 'stick', plural [ʃtɛk], cf. Modern German *Sto[k], Stö[k]e*. Opacity has caused the re-analysis of the devoicing rule

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[43] Although Low German is usually considered a separate language, there is in fact mutual intelligibility between the southern dialects of Low German and the northern dialects of central High German, so that innovations constantly spread back and forth over the border between the two.

[44] Historically, it was the [s] that was the original Proto-Germanic sound, with [z] deriving from medial lenition of fricatives in the Middle German period, i.e. the sound change that gave rise to the alternation in fricatives was independent of Middle German devoicing, which at first applied only to stops (Old German fricatives were all voiceless). After both changes occurred, however, the stop devoicing rule and the fricative voicing rule were re-analyzed as a unified final obstruent devoicing rule, since the surface alternation patterns for stops and fricatives were identical: medial voiced alternating with final voiceless.

as a lexical phonological rule, applying only in certain morphological contexts (such as certain noun singulars).

It is arguable that we are merely looking at a restructured lexicon, with the older devoicing rule now fossilized in certain words. However, other pieces of evidence, such as the example of 'mountains' above, where the devoicing rule was exceptionally applied to one of the outputs of apocope, suggest that the rule must have been productive to at least a small degree. Nevertheless, we predict that such a situation is inherently unstable, and that such a lexical devoicing rule would sooner or later be lost, leading to the leveling of alternations, as in Yiddish. In conclusion, this Silesian example indirectly supports our analysis of Early Modern German.[45]

Other dialect surveys corroborate this analysis. In the same volume (no. 56) of *Deutsche Dialektgeographie* (Tita 1965, Kuck/Wiesinger 1965), there are surveys of dialects from Pomeranian Low German (Bublitz) and East Prussian High German (Ermlandish) that show precisely the same kind of pattern: recently occurred apocope has resulted in the lexicalization, but not complete loss, of the final devoicing rule. The Low German study is especially instructive, since the author of the survey provides morphological paradigms showing where the devoicing rule is still productive, e.g. in strong verbs, like [ɣrɒːvə], 'to dig' cf. Modern German *gra[b]en*, where the first person

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[45] It also undermines the hypothesis of Sapir and Sadock concerning the loss of devoicing in Yiddish, according to which leveling *preceded* apocope. The trend is clearly for apocope to render devoicing opaque, with the possibility of the complete loss of devoicing at a later stage.

singular present indicative, Modern German *(ich) gra[b]e*, is [ɣrɒːv], but the past,

Modern German *(ich) gru[p]*, is [ɣrɑʊf][46].

Not all such surveys support our theory, however. An older study of Silesian found that devoicing applied to the outputs of apocope in another area that underwent it (von Unwerth 1908:44). Similar patterns can be found in e.g. Luxemburgish, a (semi-standardized) Middle Franconian dialect that has retained the voicing contrast, undergone regular phonological apocope, and yet which shows final devoicing also in forms where it is not expected according to our hypothesis (Keller 1961)[47]. Given that these various dialects have broadly similar lexicons and grammars, it is hard to explain why apocope would have such opposite effects on devoicing.

3.5   Apocope and loss of devoicing in Early Modern Dutch

Old Dutch (pre-1200) had a rule of final devoicing, as the spellings attest (Goossens 1974:65-66), just as in Middle German[48]. The fact that devoicing appeared in Dutch at around the same time as in German suggests the two phenomena are related, although it

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[46] The final schwa of the infinitive derives from original *-en*, as in the Modern German infinitive. Note that the non-periphrastic preterit was retained in Low German, while it was lost in Upper German and Yiddish. Conceivably, this would have helped a lexical devoicing rule to survive longer.

[47] As in Yiddish, in Luxemburgish the final schwa of inflected attributive adjectives was preserved from apocope. Otherwise, apocope was quite regular, and ought to have introduced enough opacity in devoicing to hinder productivity. There may even be some internal evidence that Luxemburgish lost final devoicing completely after apocope occurred. Thus, historical final /ɣ/ was devoiced, e.g. *ewe[ç]* 'away', but in alternating *We[Ø], We[Ø]en* 'path(s)' the final fricative has disappeared completely (Bruch 1953:172). Although the loss of the dorsal fricative is usually found intervocalically, the loss in final position in alternating forms suggests that perhaps it was a postvocalic change only, but one that occurred after apocope had rendered final devoicing unproductive. However, this could also be interpreted as a restructuring of the UR of 'path' as /veː/, following the loss of /ɣ/ in the plural /veɣən/ > /veːən/.

[48] Since Dutch is not attested as early as German, the "Old" period of Dutch corresponds in time to early Middle German, while "Middle Dutch" corresponds to late Middle German and early Early Modern German.

is possible that Dutch devoicing arose independently. For our purposes, it is enough to know that Dutch in its earliest period had a robustly attested devoicing rule. Thus, *fan[t]* 'found', but *fin[d]an* 'to find'; *utgan[k]* 'exit', but *gan[g]a* 'passages'; *ga[f]* 'gave', but *ge[v]an* 'to give'[49]. This rule was reinforced in the Middle Dutch period (post-1200) by the voicing of fricatives in medial position, e.g. *hui[s]* 'house', but *hui[z]en* 'houses'[50].

In early modern Dutch final schwa was apocopated, as in Upper German (Goossens 1974:55). This process may have originated separately from the Upper German apocope, since some apocope is attested already in the Middle Dutch period (van Loey 1966), at the same time that some restricted apocope was already under way in Upper German (Keller 1978:273-4). Dutch apocope, like that of Upper and West Central German, was a regular sound change, although the effects of the change were obscured by later morphological levelings and re-analyses[51].

As with Early Modern German, schwa apocope can be shown to have interacted opaquely with final devoicing in Early Modern Dutch. Moreover, we even have some evidence that voicing was leveled in certain paradigms. Thus, around the time apocope occurs in the early modern period one sees spellings reflecting, for example, a contrast between final [ɣ] and final [χ], e.g. *ick lagh* 'I lay' (from *liggen* 'to lie'), but *ick lach* 'I

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[49] Dutch and Low German had voiced fricative reflexes of Proto-Germanic /b/ in non-initial position, whereas High German had voiced stops.

[50] Goossens notes that the Old and Middle Dutch spelling did not always reflect the devoicing rule. He assumes that this was merely a matter of orthographic irregularity, though it could also mean that the devoicing rule was subject to variation.

[51] Apocope in Dutch shows more exceptions than Yiddish and Luxemburgish, though fewer than in East Central German. Deadjectivals like *breedte* 'breadth', the weak preterit in *–te*, and inflected attributive adjectives are all exceptions (van Haeringen 1937). Russ 1982 argued that this evidence shows apocope was a grammatically conditioned sound change. Recently Mondon 2009 has argued for a different analysis that breaks down unconditioned apocope into different phonologically conditioned changes, whose results were affected by analogical leveling. Be that as it may, there is enough evidence that apocope was a phonologically conditioned process that we can safely call it a sound change, and therefore assume that it was added to the end of the grammar, after devoicing.

laugh', cf. Middle Dutch *ick lach, ick lache* (van Bree 2003:263ff. and references).

Again, van Bree reports that certain early modern grammarians reported final voiced

pronunciation in words like *we[ɣ]* 'path' (van Bree 2003:265), which was historically

schwa-less. Voicing in final position in this case can only have come about through

leveling, *not* through apocope. Early modern orthoepists confirm this interpretation of the

spelling patterns.

It is true that, like German, Dutch spelling became normalized in the 16th and 17th

centuries, so that one could conceivably attribute the leveling of voicing alternations to

the adoption of "morphemic" spelling, along the lines of Hermann Paul's arguments for

the development of German spelling. However, Dutch spelling is not entirely morphemic

even today, and the representation of final devoicing has been maintained for some

alternations, namely those involving underlying /v/ and /z/: *huis ~ huizen, ik geef ~ geven*.

This shows at least that Paul's theory of the development of writing, that phonemic

systems invariably turn into morphemic over time, is not watertight. If we wish to adopt

Paul's theory of the development of writing, we would have to account for why German

spelling became "purely" morphemic, while Dutch spelling remains partly phonemic to

this day.

3.6   East Central German

East Central German apocope did occur, but with more restrictive phonological and

morphological conditioning than as found in Upper and West Central German. According

to Keller 1978, apocope actually began in the same way it began in the rest of the

German-speaking region: as an unconditioned deletion rule targeting all final schwa. However, whereas in other regions apocope went to completion, with the exception of inflected adjectives, in East Central German apocope stopped progressing at a much earlier stage, and then was reversed in several categories. Eventually, final schwa was even added to categories where it had not existed in Middle German.

From the example of Yiddish, we could predict that wherever unconditional apocope occurs, it should interact opaquely with devoicing, and that this opacity should lead to the eventual loss of the devoicing rule, because the number of exceptions introduced by opacity would hinder the rule's productivity. What do we predict should happen with the more restricted form of apocope that occurred in East Central German?

Apocope rendered final devoicing opaque because it was added to the derivational series after the devoicing rule. This happened because apocope was a regular sound change, which we represent by the addition of a phonological rule. However, loss of final schwa might take place without the help of a phonological rule deleting final schwa:

- because a rule of inflectional or derivational morphology adding final schwa fails to apply: e.g. the dative singular is formed by adding schwa to the stem, *Tag –> Tage*; if this rule is lost, *Tage* becomes *Tag* without the help of a phonological deletion rule
- alternatively, where the schwa is part of the stem, restructuring of the stem through lexical analogy can cause the schwa to be lost without phonological deletion: e.g. *ja*-stem class adjective *schräge* become *a*-stem class *schräg*

If it turns out that East Central German apocope involved morphological and lexical changes like the above, then we would predict that such changes would not render devoicing opaque and liable to loss.

Yet as Keller notes, apocope, at least in its early stages, was clearly phonological, even in East Central German, and as we saw, there was one text from Upper Saxony that showed evidence of opaque devoicing as a result of apocope. In addition, the final outcome of apocope in East Central German, although less sweeping than in Upper German, nevertheless showed unambiguous phonological conditioning.

3.6.1   East Central German apocope

After the back and forth between apocope and restoration of schwa had settled down, German ended up with permanent apocope in the following categories (Wright 1907:79ff.):

- In the syllable preceding or following the secondary accent (Behaghel's Law):
  boúmgàrte > boumgart, állerhànde > allerhand, átemùnge > atmung

- In *adjectives* and *nouns*, final *e* was lost in disyllables if the preceding consonant was a voiceless obstruent or a sonorant or vowel: *spæte > spät, küele > kühl, niuwe > neu*, but *träge, weise*[52]

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[52] The restriction to adjectives and nouns appears to be due to the fact that final schwa was analogically restored in all verb forms where this apocope occurred, e.g. in the imperatives.

Wright further reports that final schwa in the dative singular of nouns and adjectives fluctuates with zero in disyllabic forms, depending on "sentence rhythm", but he notes that in the modern spoken language it is usually lost (and by the late 20th century in the written language, too). Thus, either *Tage* or *Tag* is permissible as the dative singular of *Tag*, though only the latter is typically found today[53].

3.6.1.1 Behaghel's Law

With respect to Behaghel's Law, the conditioning is purely phonological, and hence we may label this a regular sound change without difficulty. However, the requirement for the eliminated vowel to either *precede* or *follow* the syllable of secondary stress seems a little hard to capture in a non-disjunctive statement. Also, according to Wright's description the law targeted both word-final (apocope) and word-internal schwa (syncope), e.g. *atemunge > atmung*. Other grammars, e.g. Reichmann & Wegera 1993, do not group syncope and apocope together, suggesting that perhaps Wright's description could be disputed on the grounds of accuracy.

Keller 1978 and Reichmann & Wegera 1993 also argue that apocope targeted final schwa after a derivational suffix, e.g. nouns in *–unge, -nisse,* or adjectives in *–liche*, becoming *–ung, -nis, -lich*, respectively. To say that apocope was blocked in certain morphological environments contradicts the traditional assumption of exceptionless sound change, so this does not seem a significant improvement on Wright's description.

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[53] "Sentence rhythm" suggests some kind of phonological conditioning. On the other hand, the restriction to the dative singular, and not the phonologically identical nominative/accusative plural *Tage*, suggests this is an analogical, morphologically conditioned change. A sensible solution is to say we are dealing with morphological variants, while the ratio of variants is affected by phonological or phonetic factors (cf. Kiparsky 1989 on constraints in phonological variation).

Also, this analysis ignores cases where the second compound element was probably semantically opaque, e.g. *herzoge > Herzog* 'duke', in which the second element *zog(e)* no longer occurs on its own (the original meaning was 'leader', *herzoge* being 'army leader', Old High German *heri-zogo*).

The two descriptions can be reconciled if we revise the description in the following way: rather than say schwa is deleted before or after the secondary stress, we say instead that schwa was deleted after any stressed syllable, whether primary or secondary. Of course, there are examples like *Zunge* 'tongue', where apocope of schwa appears to have been blocked. However, since the root syllable was originally /t^{s}ʊng-/, with a voiced obstruent /g/, the presence of schwa in this word can be accounted for by the general rule that apocope was blocked (or final schwa restored) after voiced obstruents[54].

One could argue that since /ng/ becomes the velar nasal /ŋ/ in Modern German, that apocope should not in fact be blocked, but then one would have to argue that assimilation of /ng/ had already occurred before the time of apocope. Given that we still find clear evidence of surface [ŋk] from underlying /ng/ in Early Modern German, e.g. *junckfrau* 'virgin', from /jung/, this would be a hard case to argue. But even granting that assimilation had already taken place, we could argue that schwa was restored because *zunge* was a feminine weak noun, and Wright observes that feminine weak nouns in general preserve schwa. So *zunge > zung* could have occurred, but later final schwa was restored by morphological analogy.

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[54] There is another possibility, namely that /ng/ had already assimilated medially to the velar nasal, as in Modern German. If so, 'tongue' should have ended in a sonorant, which does not block apocope.

There do not appear to be any counter-examples, e.g. a word like *fór-e-de-rùng-e* > *for-e-drung-e*, where the deleted vowel was not the one following the primary stress, but precisely the one preceding the secondary stress. Rather, the examples Wright offers for Behaghel's Law can generally be accounted for by positing deletion of schwa after any stressed syllable. Cases cited by Wright where this does not occur can be attributed to later vowel epenthesis, analogy or borrowing:

(32) *vorderunge > forderung* 'claim'

  küneginne > königin 'queen'

  krëbeze > krebs 'cancer'

  fremide > fremd 'foreign'

  hemidi (Old High German) > *hemd* 'dress'

  kebisa (Old German) > *kebse* 'concubine'

  muniza (Old German) > *münze* 'coin'

  lëbete > lebte 'he lived', and other forms of the weak past in *-te*

The second vowel in *forderung* is probably due to vowel epenthesis, from *fordrung*, or perhaps because of the infinitive *fordern*. The –*ig* in *könig* and derive *königin* 'queen' had secondary stress and thus did not undergo syncope. While *fremide > fremde*, or *hemidi > (hemede) > hemde* is easy to explain (with a secondary stress on the final syllable), the subsequent deletion of the final vowel is hard to explain using Wright's description; the final voiced /d/ should have prevented apocope. But this could be due to lexical analogy, along the lines of *schræge –> schräg* (see below).

Likewise, why do we have *krebs* but *kebse*? One of the two must be a dialect borrowing or analogical remodeling, since you cannot get both forms out of a single regular sound change. If *kebse*, as is likely, is the borrowing (see Kluge 1975), then we still need to say how we get *krebs* from *krebeze*, since deletion should only have targeted the middle vowel, *krebse*. However, Kluge 1975 shows that there were two variants in Middle German, *krebez* and *krëbeze* (with different root vowels), so modern *krebs* is probably derived from the former variant. In that case, the loss of the vowel could be due to the same syncope that created variants like *tags* for *tages* (see Keller 1978:406).

A consequence of this approach is that there is no special law targeting schwa in the environment of secondary, as opposed to primary stress, but rather a single, unified schwa deletion rule conditioned by preceding stress. It seems the main reason to treat Behaghel's Law as a separate process is as follows: where the schwa occurred after the secondarily stressed syllable, the [voice] specification of the preceding segment was irrelevant, so *allerhande > allerhand, herzoge > herzog*. Where apocope occurred after the primarily stressed syllable, on the other hand, apocope was blocked if the preceding segment was [+voice, +obstruent], so *spæte > spät*, but *træge > träge*. There is also the fact that schwa is less prone to restoration after derivational suffixes than after stems. Therefore, there is some evidence that apocope after secondary stress is treated somewhat differently from apocope after primary stress[55].

3.6.1.2 Blocking of apocope by preceding voiced obstruent

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[55] Cf. above on Middle German schwa deletion, which occurred after primary stress only in limited conditions.

After Behaghel's Law, apocope seems to have been generalized to all word-final schwa, except where the preceding consonant was a voiced obstruent (provided we automatically attribute the lexical exceptions to analogy). Although the sound change can be stated in terms of phonological conditioning only, the statement is disjunctive: schwa was lost after voiceless obstruents *and* sonorants *and* vowels, *but not* voiced obstruents, i.e. the preceding segment must either have the feature specifications [–obstruent] *or* [+obstruent, –voice]. This conditioning is most strikingly attested in the class of former neuter collectives signified by the prefix *ge-*, all of which ended in *–e* in Middle German (being *ja*-stems originally):

(33)   *Gebäude, Gebinde, Gebirge, Gedränge, Gefilde, Gefolge, Gelände,*
        Geleise, Gehänge, Gemüse, Gepräge, Gesinde, Getreide, Gewebe, Gewerbe,
        Gewölbe

but,

(34)   *Gebiet, Gebüsch, Gedicht, Gefährt, Gefecht, Gehirn, Gehöft, Gehölz,*
        Geleit, Gelüst, Gepäck, Gerät, Geräusch, Gerüst, Geschäft, Geschenk,
        Geschirr, Geschlecht, Geschrei, Gesetz, Gespann, Gespenst, Gestirn,
        Gewächs, Gewicht, Glück

One could argue that sonorant consonants and vowels are redundantly voiced in German, so that we are looking at some kind of underspecification effect. If we use privative

feature theory, we can say the apocope rule applies after segments *not specified* for [voice]; the [voice] feature is then added to [–obstruent] segments redundantly at a later stage, e.g. *kühl*. Under this approach, the blocking effect is illusory, since really we are dealing with a phonological conditioning environment at the underlying level. However, such an approach begs the question of whether sound change should be able to occur anywhere else than at the surface level of representation (see discussion below on rule insertion)[56].

The fact that apocope seems to be avoided where it might provide input to final devoicing suggests that the two are perhaps involved in a phonological conspiracy. There are two ways we can try to explain this apparent conspiracy. One way is to stipulate the blocking effect in the description of the rule, and say that apocope was blocked if the schwa was preceded by a voiced obstruent. The problem with this solution is that the blocking effect remains unexplained. Another way is to adopt teleology and argue that apocope did not occur after voiced obstruents *in order that* the obstruents should not be subject to devoicing (this is Wright's approach). Yet teleology as a motivating factor for sound change is highly controversial in historical linguistics, and a non-teleological approach, if available, should be preferred.

The teleological problem can be circumvented, however, by adopting an output-oriented theoretical framework like Optimality Theory. We simply rank the markedness constraint FINALDEVOICING (which targets obstruents only) above the faithfulness constraint IDENT-IO[voice], so that when apocope occurs, by promoting *FinalSchwa

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[56] Note that under this analysis, final devoicing would have to bleed redundant voicing: the /g/ in /tag/, with specified [voice], would lose that feature first in the derivation. Then redundant feature-filling would not apply because the /g/ is specified [obstruent] (or the appropriate node in the feature hierarchy), and redundant voicing does not apply to segments specified as [obstruent].

above MAX, it is automatically blocked where the devoicing constraint would be
violated:

(35)

/gebiete/	FINDEVOI[obst]	IDENT-IO[vce]	*FINALSCHWA	MAX
Gebiete			*!	
☞ Gebiet				*
Gebiede		*!	*	
Gebied	*!	*		*

/gebinde/	FINDEVOI	IDENT-IO[vce]	*FINALSCHWA	MAX
☞ Gebinde			*	
Gebind	*!			*
Gebinte		*!	*	
Gebint		*!		*

The fact that voiced obstruents did not block apocope in some cases, like *o[b]e > o[p]*, or
allerhan[d]e > allerhan[t], can be dealt with by refining the constraints used for
enforcing apocope. For example, instead of a single *FinalSchwa constraint, we have one
constraint that only affects schwa after unstressed syllables, which is ranked higher than

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Ident-IO[voice], while another constraint eliminates schwa after stressed syllables, which is ranked lower as in the above tables.

(36)

/obe/	FinDevoi	*FinSchwa(NoStress)	Ident-IO[vce]	MAX
☞ o[p]			*	*
o[p]e		*!	*	
ob	*!			*
obe		*!		

Dealing with clear analogical remodelings like *schräg* is trickier, but the ability of OT to handle the regular phonological patterns is clear enough. Simply fine-tuning the description of the constraints can capture the more fine-grained conditions on Middle German apocope (see above).

However, with respect to dialects where apocope led to the eventual loss, rather than restoration of devoicing, we saw earlier that OT struggles to account for the opacity of devoicing. Although in this case OT appears to provide an elegant description of the change, in light of the difficulties with Yiddish opacity, we will attempt to find another explanation.

A non-teleological explanation for the blocking effect that also avoids the pitfalls of OT is as follows: apocope affected all final schwas, and the result was that in some cases, voiced obstruents now surface in word-final position, e.g. *træge > træg*. Later,

schwa was inserted after the resulting word-final voiced obstruents, thus *træg* > modern *träge*. In some isolated cases, devoicing applied to the new final voiced obstruents, e.g. *schræg* > *schræ[k]*, with the result that schwa was not inserted, thus modern *schräg*, with final [k]. This requires us to suppose that the devoicing rule did become opaque as a result of apocope. However, it also requires us to suppose that devoicing re-applied to at least some of the outputs of apocope.

3.6.2   Morphological factors in East Central German apocope

The role of analogy in the subsequent distribution of final schwa is also clear from Wright's description. In several categories, final schwa was actually added by various analogical processes, where it was not found in Middle German e.g. the nominative/accusative plural of neuter *a*-stem nouns, *wort* 'words' → *worte*. Moreover, in the categories where schwa was lost regularly, according to the above conditions, analogy appears to have restored final schwa in some cases: e.g. among the imperative forms of verbs, Wright notes that forms which lost schwa according to the late Middle German apocope, e.g. *vare* > *var* (imperative), later regained schwa on the analogy of forms that never lost it, thus modern *fahre*. In some cases, apocope occurs where it should not have occurred by regular sound change, e.g. *schræge* –> *schräg* (cf. number Two above), or dative singular *tage* –> *tag*: these can only be accounted for by some kind of analogy, or perhaps dialect borrowing.

3.6.3   Final devoicing in Early Modern East Central German

Although the evidence of Early Modern Upper German strongly supports the hypothesis that apocope rendered devoicing opaque, causing its eventual loss, as we have seen the developments in East Central German, which has been the main influence on literary German from the 16th to the 19th centuries, are rather different. Apocope did not target all final schwa, as it did in Upper and West Central German, but was even blocked where the preceding segment was a voiced obstruent, i.e. a potential input for devoicing.

Is the conditioning of East Central German apocope different in such a way that we would not expect devoicing to become opaque? Not quite, since we have seen evidence of unambiguously phonological conditioning in e.g. Behaghel's Law. Moreover, Behaghel's Law should have resulted in new final voiced obstruents in at least some cases, so we have to deal with the possibility that devoicing became opaque. Finally, our tentative explanation for the retention of final schwa in disyllable after voiced obstruents, e.g. in *träge*, requires that apocope had resulted in final voiced obstruents, i.e. opaque devoicing.

On the other hand, there is evidence that final devoicing was restored fairly early in East Central German. Sources include the grammar of Johannes Clajus (*Grammatica Germanicae Linguae,* 1578), who explained the spelling conventions of contemporary German, in which final devoicing was no longer represented, by a principle that does correspond closely to the "morphemic" principle encountered earlier, the so-called *Explikationsregel* ("explanation rule"). This rule explained that e.g *Kalb* 'calf', although pronounced [kalp], must be written with a <b>, because the plural *Kelber* is pronounced

with [b]. This indicates that Clajus' audience, and possibly Clajus himself, still employed final devoicing, although the normative pronunciation quite possibly did not.

This suggests that for the new East Central German standard, the spelling really did reflect a shift to a morphemic system from the Middle German phonemic system. However, for Upper German, the dialect of the East Franconian Ickelsamer, we believe the spelling reflected their actual pronunciation, i.e. a dialect that had lost devoicing. The use of the same spelling in East Central German is due, in that case, to the purely literary influence of the old Upper German norm on the new East Central German norm. In other words, a dialect that had never lost, or had recently restored final devoicing, did indeed adopt a spelling system that reflected a different phonological system. This was not due to a principled change in orthography, as Paul held, but to the convergence of literary standards.

So we have to consider how devoicing may have re-entered the language quite soon after apocope ended. We also have to consider the reasons that apocope did not go to completion, and ended up with the restricted conditioning that it has in Modern German, and what relationship this might have with devoicing. Finally, we have to consider the effects that the shifting centers of prestigious High German had on the pronunciation of final devoicing.

3.6.3.1 Lenition in East Central German

What about the evidence that East Central German was in fact a leniting dialect? The old Middle German norm, to the extent it existed, maintained a voicing contrast. But there is

evidence that lenition began to affect East Central German already in the 14th century (Mihm 2004:175), and we can presume that lenition also affected other Upper German areas at this time; the current area of lenition includes the vast majority of the Upper German region. However, since lenition was still an innovation in the late Middle German/early Early Modern German period, it is not surprising that the normative pronunciation would hold to a more conservative standard that maintained the contrast. The evidence of Johannes Clajus' shows that normative East Central German in the 16th century had final devoicing, i.e. it had not yet undergone lenition. But by the time of Goethe, lenition had affected even normative pronunciation.

3.6.4   Opacity and loss of devoicing in East Central German

The evidence from the Bonn Corpus showed that apocope most likely had the same effect on Early Modern German devoicing, or at least Upper German devoicing, as it did in Yiddish: the addition of the apocope rule caused devoicing to become opaque, resulting in the patterns we see, where devoicing applies at a significantly higher frequency in words that historically had no final schwa. This represents the morphologization of the devoicing rule. Subsequently, the leveling of final voicing into those forms that originally had devoicing took place, representing the actual loss of the devoicing rule, which resulted in the surfacing of underlying [voice] in final position.

But we still have to explain how and why Modern German (and Modern Dutch) has devoicing today, despite the evidence that devoicing had already been lost in the Early Modern period. There are several possible answers, all of which hinge on the fact

that Modern German does not descend directly from the literary Middle German dialect, which was largely Upper German, but from East Central German and the High German of the northern, formerly Low German cities (Keller 1978).

The first possible answer depends on the doubtfulness of the written evidence for East Central German, where apocope did not go to completion and where we have evidence that devoicing still existed in the language at least by the end of the 16th century. This suggests the possibility that devoicing remained transparent and productive throughout the period of apocope in East Central Early Modern German, though not in Yiddish or Upper German. If that is true, we need to determine whether or not the phonological characteristics of either final devoicing or apocope were such as to lead us to expect this kind of outcome.

The second is to accept that devoicing became opaque temporarily in East Central German, but that it was not lost completely and somehow remained productive in the grammar, and that some kind of grammar restructuring is responsible for the "restoration" of transparency. That would mean that the written evidence is accurate with respect to the opacity of Early Modern devoicing in the 14th and 15th centuries, but inaccurate with respect to the apparent loss of devoicing and leveling of alternations in the 16th and 17th centuries. Again, we need to examine the phonological description of the devoicing rule and the apocope rule in order to determine whether such a development is plausible or not.

The third possibility is that devoicing was indeed lost completely even in East Central German, and that the transparent devoicing rule of Modern German (and perhaps Dutch) has independent origins. There are in fact two ways we can account for such

independent origins. One is that final devoicing arose again as a second sound change within German and Dutch. The other is that final devoicing entered German and Dutch through contact with languages or dialects that still had final devoicing.

4   Retention of transparent devoicing in East Central German

In this section, we will assume that our interpretation of the written evidence is not necessarily correct for East Central German, and that the loss of devoicing in the Early Modern period only attests to a change in spelling. Under such an assumption, we would have to discover a framework in which final devoicing would be permitted to apply to the outputs of schwa apocope, despite the fact that apocope was added to the grammar later in time than devoicing. If the theoretical arguments are strong enough, we may be justified in doubting the conclusions we drew from the Early Modern evidence in the previous chapter.

4.1   Rule addition, rule insertion and relative chronology

One theoretical solution to our conundrum is the concept of "rule insertion", where a rule is added somewhere before the end of the series of rules, not, as in Yiddish, at the very end. If the apocope rule had been *inserted* before the devoicing rule in the derivational series, then apocope would automatically feed devoicing, and devoicing would have remained transparent. It only remains to be determined whether either the devoicing rule or the apocope rule was such as to make rule insertion a likely scenario.

It is worth emphasizing that the possibility of rule insertion is unavailable to traditional methods of internal reconstruction. Rule insertion means that grammars can change in such a way that the actual chronology of events is obscured, as the following chronologies show:

(37)   Middle German grammar

UR	/tag/	/tagə/
Devoicing	tak	--

(38)   Early Modern German grammar

UR	/tag/	/tagə/
Apocope	--	tag
Devoicing	tak	tak

Although we would still hold that apocope entered the grammar *after* devoicing had entered the grammar, we would not be able to deduce this from the synchronic ordering of rules after insertion had occurred. According to the methods of traditional internal reconstruction, on the other hand, we would be forced to posit that apocope first created exceptions to final devoicing, i.e. *tage > tag*, and that only afterwards was devoicing "extended" to these exceptions by some analogical process. Alternatively, we can suppose that a *second* final devoicing occurred, i.e. a sound change. But we cannot

suppose that the application of devoicing to the outputs of apocope was immediate and automatic, which is what rule insertion would predict.

We can illustrate this by another example, namely the Proto-Indo-European rule known as *Sievers' Law* (Ringe 2006:16, 118-122). This rule vocalized a high front glide, or possibly inserted a high front vowel before the glide, if the glide was preceded by a heavy syllable:

(39)   Sievers' Law: VV.CjV > VV.Ci.jV

VC.CjV > VC.Ci.jV

Thus, examples using the suffix /-jos/:

(40)   */pedjos/[57] 'of feet; on foot', Greek /pesdos/ = [pezdos] 'on foot', where /dj/ > [dz] > [zd] = /sd/, but

(41)   */neptijos/ 'of grandsons', Greek /anepsios/ 'cousin', where /t/ > /s/ before /i/

In the transition from Proto-Indo-European to Proto-Germanic, Sievers' Law appears to have re-applied to the outputs of a vowel epenthesis rule, which had created new heavy syllables:

(42)   Proto-Indo-European   *wr̥.gje.ti 'he works'

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[57] The asterisk is being used to symbolize reconstructed forms, not ungrammatical forms.

Sievers' Law	*wṛ.gje.ti (no change), Avestan /vṛzjeti/
pre-Proto-Germanic	*wur.gje.ti (epenthesize /u/ before sonorant)
Sievers' Law	*wur.gi.je.ti
Proto-Germanic	*wur.kiː.θi (/ije/ > /iː/), Gothic /workiːθ/

As we see, in Proto-Indo-European, syllabic sonorants are treated as short vowels, so that /wrgje-/ had the syllabic structure CV.CjV, i.e. it was not an input to Sievers' Law. However, in pre-Proto-Germanic, a /u/ was epenthesized in front of all syllabic sonorants, and the sonorant became non-syllabic[58]:

(43)   u-Epenthesis   Ṛ > uR

As we see in our example, u-Epenthesis created new heavy syllables of VC.CjV structure (cf. 1). Rather than u-Epenthesis simply creating exceptions to Sievers' Law, the Proto-Indo-European rule applied to these new inputs that arose, not from borrowing, but from internal sound change.

    If we apply traditional methods of historical reconstruction to this case, we might conclude that the ouputs of Epenthesis were analogically remodeled on other forms

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[58] The change looks quite similar to what happened in the transition from Old Icelandic to Modern Icelandic: vocalic /r/ became /ɤr/, written –ur, e.g. *maðr* 'man' > *maður*. Phonologically, there must have been at least two parts to this change: first, some kind of excrescent high vowel must have appeared in the articulation of the syllabic sonorant, which was then re-analyzed as an epenthetic high vowel /u/. Once the epenthetic vowel found its way into the phonological representation, the sonorant became re-analyzed as non-syllabic, owing to the sonority hierarchy (/u/ is preferable to /r/ as the syllable nucleus). The selection of /u/ to represent the excrescent vowel would have been supported by the fact that an underlying /u/ already existed in Proto-Indo-European, in roots that participated in ablaut, e.g. *bʰewg-* 'flee', *bʰug-*, cf. Greek /pʰeugɔː/ 'I flee', but /epʰugon/ 'I fled'.

where the effect of Sievers' Law was still visible. E.g. hypothetical pre-Proto-Germanic *[wurgjeti], was remodeled on the "analogy" of (non-hypothetical) forms that still obey it, like [saːgijeti] 'he seeks' (Proto-Germanic [soːkiːθi]). The regularity of this analogical remodeling, however, does not fit very well with the traditional conception of analogy as a lexically gradual process. It seems more probable that we are looking at the effects of synchronic rule application.

4.1.1 Rule addition

The usual way for rules to be added to grammars is at the end of the derivational series (Halle 1962, King 1969). Below we have the two rule addition events that introduced Sievers' Law and u-Epenthesis. First in pre-Proto-Indo-European:

(44) Add the Sievers' Law rule

[ ] → [i] / V:C __ j V

VCC

(45) Pre-Proto-Germanic: Add sonorant vowel epenthesis

R̩ → uR

At this point we have to consider where the rule is added. If we suppose the rule is added at the end of the series of rules, we will have to assume the following ordering of rules in pre-Proto-Germanic:

(46)   Sievers' Law

        Epenthesis

This rule ordering would derive the following surface representation (SR) from the underlying representation (UR) /wr̥gjeti/:

(47)   UR   /wr̥gjeti/

        Sievers' Law   wr̥gjeti

        Epenthesis   wurgjeti

As you can see, the result of the addition of Epenthesis is an *exception* to the Sievers' Law rule. Although Sievers' Law is still active in the grammar, it no longer obtains transparently on the surface, i.e. it has become *opaque*. However, we also know that such exceptions to Sievers' Law are not attested.

The same problem confronts us with respect to Early Modern German apocope and the final devoicing rule. As we saw above, apocope consisted in one or more sound changes, in addition to various subsequent analogical levelings and extensions. The sound changes at the very least must be treated in the same way as pre-Proto-Germanic

Epenthesis, i.e. as addition of new rules. Adding the apocope rule at the end of the

grammar, moreover, ought to have resulted in the same kind of opacity:

(48)   UR   /obə/   /tag/

        Devoicing   –   tak

        Apocope   ob   –

In order for /ob/ to end up as Modern German devoiced [ɔp][59], we have to consider the

possibility that the apocope rule had been inserted *before* devoicing.

4.1.2   Rule insertion

As mentioned above, Halle 1962 (supported by Kiparsky 1965) believed that rules should

be added at the end of the series of rules. However, Halle qualifies this by saying that

rules may be added at the end of the series *within the relevant component of the*

grammar. According to Halle, there are three components of phonology, starting with the

morphophonological component, in which re-adjustment rules operated. An example

related to Proto-Indo-European and Proto-Germanic is *ablaut*. This was a rule whereby

the vowel of the lexical root was changed according to derivational or inflectional class,

e.g. Proto-Indo-European /es/ 'be' → /s+enti/ 'they are', but /es+ti/ 'he is', with the '+'

indicating morphological boundary between root and suffix. The input and output of the

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[59] And also Yiddish *op*, where the final [p] shows that devoicing must have exceptionally applied to this word after apocope, while the other outputs of apocope in Yiddish did not undergo devoicing.

ablaut rule could be described in purely phonological terms, but the conditioning environment was not phonological, but morphosyntactic.

Then there is the phonological component. Unlike the morphophonological component, input, output and environment can all be stated in phonological terms, meaning that the statement must be in terms of binary distinctive features or otherwise discrete categories. Thus, both Sievers' Law and German final devoicing can be stated in terms of binary features only: in the former, the conditioning environment includes the metrical quantity of the preceding syllable of the glide; in the latter, the environment is the edge of the prosodic word (see the beginning of the first chapter for a formal statement of the devoicing rule with binary features)[60].

Finally, there is the phonetic component. Phonetic rules, unlike phonological rules, do not deal in binary features or discrete categories, but typically convert binary distinctive features into "*n*-ary" values, i.e. they convert one value of a phonological opposition into the phonetically gradient values that we actually see in real-life speech. These gradient rules may be rule-governed, i.e. conditioned by particular phonological, phonetic, or even semantic or pragmatic contexts, but they are not considered phonological because they are not binary, and also because they are not crucially ordered. Every phonetic rule should apply to every potential input without exception (King 1973).

Because of the separation of phonology into these three components, the addition of new rules may not necessarily reflect the actual chronology of changes. That is, a rule that had entered the grammar at an earlier date may end up situated *after* a lately added rule. This is known as *rule insertion*. Halle's guidelines suggest that rule insertion should

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[60] As noted above, the prosodic word does not necessarily correspond to the lexical word, e.g. where we are dealing with clitics. However, usually the two share the same boundaries.

be constrained by these distinct components, although strictly speaking they do not have to be so constrained. For example, Kiparsky's citation of Lachmann's Law in Latin involves the insertion of one phonological rule before another. According to Kiparsky, Halle's constraints on rule insertion represent tendencies rather than absolute universals[61].

Could it be that Epenthesis was added *before* Sievers' Law, and that this is why we do not see any exceptions to Sievers' Law? In that case, we would get the correct, *transparent* synchronic derivation:

(49)   UR   /wr̥gjeti/

        Epenthesis   wurgjeti

        Sievers' Law   wurgijeti

This would be a plausible analysis if Siever's Law were phonological, while Epenthesis were morphophonological, or else if Sievers' Law were phonetic, and Epenthesis were phonological. That Sievers' Law is phonological seems pretty clear: the input, output and environment of the rule can be expressed in purely phonological terms, so the rule cannot

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[61] In brief, Lachmann's Law was the lengthening of root vowels before *underlying* voiced obstruents in forms derived from the "third stem" (Aronoff 1994). These stems consisted of the root syllable followed by /t/ or /s/, e.g. *āctus* 'having been done', *āctio* 'act of doing, action', both from *agō* 'I do'. In these forms, voicing assimilation always devoiced the root-final obstruent on the surface. Voicing assimilation also occurred in Proto-Indo-European, however, which is why Kiparsky attributed Lachmann's Law to rule insertion in the prehistory of Latin. Although the phonological element of the rule is clear, the clear formulation of a Lachmann's Law rule is hindered by the fact that such lengthening occurs only in one class of stems, and not in other forms of identical phonological description, and even in this category there are several stems marked not to undergo Lachmann's Law, e.g. *fidō, fĭssus*. Moreover, root vowels that undergo lengthening in the third stem typically undergo some kind of lengthening in the past indicative as well, e.g. *agō, ēgī* 'I did'. See Strunk 1976 for why Lachmann's Law should not be treated as a single phonological phenomenon, but cf. Jasanoff 2004 for why it should.

be labeled morphophonological. Moreover, input and output may be expressed in discrete phonological categories, in this case the segmental slots C and V. Different frameworks might express the categories as [±syllabic], using moras, X-slots, or brackets and edges, but the fact remains that the categories being manipulated by this rule are discrete, not gradient.

Epenthesis for its part also seems to be phonological, rather than morphophonological or phonetic. Inputs and outputs may be expressed in terms of discrete, phonological categories: input is [+sonorant, +consonantal, +syllabic], while output is a sequence of /u/ and [+sonorant, +consonantal, –syllabic]. There is no conditioning environment, but we can say the criterion for phonological environment is fulfilled because there is no explicitly morphosyntactic conditioning. In conclusion, if pre-Proto-Germanic u-Epenthesis were a case of rule insertion, this would have to be despite the fact that both Epenthesis and Sievers' Law were to be found in the phonological component of the grammar.

4.2   Apocope as a morphophonological rule

For the same reason, Early Modern German apocope *could* be treated as an instance of rule insertion, but we would need to show that either apocope or devoicing were associated with different modules, as Halle's model predicts. But the descriptions of both rules suggest they are phonological. Thus, we know that apocope is a phonological rule in the sense that a segment, i.e. a bundle of distinctive features, is deleted in a given environment, i.e. at the edge of the prosodic word in a given set of metrical positions.

Final devoicing is also phonological, as shown at the beginning of chapter 1: input and output are expressible in discrete categories.

The "irregular" aspects of apocope, on the other hand, as seen in the various restrictions and extensions according to inflectional or grammatical category (see above), suggest the possibility that at least some parts of apocope may have involved morphophonological or re-adjustment rules of the kind that Halle would predict would be added before the phonological series of rules. Instructive examples include *schrä[k]*, from *schræge*, or *gescheit*, from *geschîde*, i.e. apocope after a voiced obstruent, where it should have been blocked, assuming we can describe these cases of irregular apocope as the output of a morphophonological rule. Our theory certainly predicts that if such a morphophonological rule is added to the grammar, it should feed purely phonological rules like final devoicing.

Recall that the traditional historical linguist strictly separates regular sound change and analogy, and more particularly, always treats analogical change as chronologically subsequent to sound change, wherever the outcome of sound change appears to have been obscured by analogy. Therefore, when we speak of addition of morphophonological apocope, we are imagining almost the inversion of the traditional chronological sequence[62].

There are two problems with the notion of morphophonological apocope. The first problem is simply that, as we saw, most of apocope actually appears to be phonologically conditioned, as we expect from regular sound change, e.g. apocope in unstressed

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[62] Addition of a morphophonological rule is another way of saying "grammatically conditioned sound change", a phenomenon excluded by the neogrammarian theory of sound change. However, when working within generative frameworks we must adopt generativist assumptions, which do not include the exceptionlessness of sound change. See Sihler 1977 and Russ 1982 for some alleged cases of grammatically conditioned sound change.

disyllables (*obe > ob*), and after the secondary accent (*allerhande > allerhand*). So even if we can characterize parts of apocope as morphophonological, and hence account for some instances of second devoicing by rule insertion, we cannot account for *all* the cases of apocope in this way.

The second problem is that the analogical extensions of apocope that we do see are hard to characterize as morphophonological or re-adjustment rules. Take *schräg* and *mild*, for example. These two adjectives had final schwa in Middle German. As we saw, phonological apocope should not have applied to these words, because the root syllables end in voiced obstruents[63]. But the exceptional extension of apocope to this small subset of *ja*-stem adjectives is not characterizable by common morphological or lexical features. Rather, these appear to be cases of genuine word-by-word lexical analogy[64].

Another example is the loss of the final schwa in the dative singular, against its retention in e.g. the nominative/accusative plural: dative singular *Ta[k]* vs older *Tage*. Rather than the output of a re-adjustment rule, the loss of the schwa suffix in the dative singular is better characterized as the *loss* of the re-adjustment rule *adding* schwa in the dative singular. In other words, the dative singular has come to be morphologically derived in the same way as the nominative/accusative singular, *Tag*: with a *zero* suffix, /taːg+Ø/.

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[63] The final schwas themselves go back originally to the suffix /-ja/.

[64] It is possible that these particular adjectives were more frequently found in their uninflected, predicative form, where they would be situated at the right-edge of the prosodic phrase. If, as is plausible, apocope originated as a phrase-edge phenomenon, only later being extended to the word-edge, then these adjectives would have undergone phonological apocope earlier, and hence would be liable to re-analysis as schwa-less forms, i.e. as *a*-stem adjectives. But this supposes that apocope originally did not respect the [voice] value of the preceding obstruent. We will attempt to work out what really happened with Early Modern German apocope later on.

In the cases of dative singular *Tag*, or the adjectives *mild, schräg*, the outputs of

analogical apocope may be legitimately characterized as inputs to final devoicing, but not

because of the insertion of a morphophonological re-adjustment rule. Rather, the lexical

re-analysis of adjectives means that the *underlying representation* of these adjectives will

no longer have final schwa. Therefore, they are not inputs for apocope, but they *are*

inputs for final devoicing:

(50)	Old UR	/mɪldə/	New UR	/mɪld/
	Devoicing	–		mɪlt
	Apocope	mɪld		–

Similarly, when the schwa-adding re-adjustment rule for the Middle German dative

singular is lost, we are no longer dealing with underlying /taːgə/, i.e. with an input to

apocope, but rather underlying /taːg/, i.e. an input to final devoicing. In conclusion, the

evidence that apocope was a morphophonological rule from the outset is not compelling,

and therefore we cannot plausibly expect it to have been inserted before devoicing on that

ground.

4.3   Apocope as a lexical phonological rule

A legitimate objection is that Halle's model of grammar, with strictly separated

morphophonological and phonological components, has been superseded in rule-based

phonology by other models. The morphophonological rules of Halle's model now correspond for the most part to the lexical phonological rules of Lexical Phonology and Morphology or LPM (Kiparsky 1982, 1988; Mohanan 1986).

A significant difference between morphophonological and lexical rules is that lexical rules are expressible in purely phonological terms, including in terms of conditioning environment. Morphological conditioning is a by-product of the interleaving of the phonological rules with the rules of morphological derivation and inflection. For example, the phonological environment of *k*-palatalization in *electri[s]ity*, cf. *electri[k]*, is the following front high vowel; however the rule only applies at the morphological level at which the *–ity* suffix is added. The environment of Proto-Indo-European ablaut, on the other hand, cannot be expressed in phonological terms at any level; the rule is entirely conditioned by morphosyntax.

In LPM, lexical rules are strictly separated from postlexical rules, according to whether the rule applies during the building of the word in the morphology, or after the words are linearly ordered after syntax. For example, English *k*-palatalization does not apply after syntax, hence *ki[k] it.* By contrast, *t*-flapping does apply after syntax, hence *hi[ɾ] it*. Unlike in Halle's model of phonology, the separation of lexical and postlexical components is related to how the phonology interacts with morphology and syntax as a parallel system, not to what kinds of features are associated with the rule descriptions themselves. Both lexical and postlexical rules are strictly phonological in their structural description.

Let us suppose we represent apocope as a lexical phonological rule. We can imagine that the application of apocope to the dative singular, but not to the nominative

plural of masculine nouns is due to the fact that it was added to the lexical phonology without going through a stage as a postlexical rule. Although assigning two inflectional affixes to different morphological levels may seem *ad hoc*, and of itself an argument against the likelihood that apocope was added as a lexical rule, we will allow it for the sake of argument.

The derivation would be as follows:

(51)	UR	/tag+DS/	/tag+NAPl/	/tag+NAS/
	Level 1	tag+ə	--	--
	Apocope	tag	--	--
	Level 2	--	tag+ə	--
	FD	tak	--	tak
	SR	[tak]	[tagə]	[tak]

We assume that the schwa-adding inflectional rules were assigned to different morphological levels, depending on whether we are speaking of the dative singular (level 1) or the nominative/accusative plural (level 2). We then also assume that the apocope rule is level 1, with the result that only the dative singular schwa is lost through apocope. Final devoicing is unaffected, since it is a post-cyclic rule, and applies to the output of this lexical apocope, which has been inserted before it in the derivational series.

However, similar issues arise with "lexical" apocope as with "morphophonological" apocope: we are hard put to determine the precise morphological conditioning of the apocope rule. Exceptional application or failure of apocope appears to

be due on the whole to word-by-word lexical re-analysis (i.e. old-fashioned analogy), or else the *loss* of some inflectional rule adding schwa (e.g. the loss of the dative singular inflection). There is no good evidence that apocope applied only at a specific morphological level.

There is one aspect of schwa apocope, though, which points to a lexical rule, namely the fact that it applies at the word-edge. Since the rule is limited to the domain of the word, for this reason it can be treated as a lexical rule. We do not have unambiguous evidence in the record for anything pointing to *postlexical* apocope, such as a predominance of apocope at the sentence or phrase edge. However, even if apocope was added as a lexical rule, we will see below that final devoicing was already a lexical rule, and therefore that apocope should not have been inserted before it in the series, if we respect Halle's constraints on rule addition[65].

In any case, apocope most likely began as a post-lexical rule, acquiring lexical conditioning only later on. If this is the case, there should have been an intermediate stage in which FD was ordered before apocope, giving outputs like *[tag]. This would conform to the consensus among historical linguists concerning the rise of lexical phonological rules in the grammar, which is that lexical rules arise out of the re-analysis of older *postlexical* rules, i.e. rules that were previously transparent and purely phonological in their conditioning. This is known as the "life-cycle" of phonological rules (Kiparsky 1989, McMahon 2000b)[66].

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[65] In (15), we represented final devoicing as a postcyclic lexical rule, which is not the same as postlexical.
[66] Kiparsky 1989 also showed that the lexical /æ/-tensing of New York and Philadelphia can be explained as the lexicalization of an older, postlexical tensing rule that more closely resembled the Northern Cities pattern. He does not explicitly rule out the possibility that a lexical rule might be added directly to the grammar, but the implication of his argument is that lexical rules only come from the lexicalization of postlexical rules.

4.4   Final devoicing as a phonetic rule

Having conceded that Early Modern German apocope was probably neither a
morphophonological nor a lexical phonological rule, we might still suppose rule insertion
to have occurred, following the model of Halle 1962, if we can show that final devoicing
was *phonetic*, rather than phonological. For this, we need to examine whether final
devoicing fulfils any of the criteria for a phonetic rule.

According to King 1973, phonetic rules can be distinguished from phonological
rules by the following criteria: they are unordered, i.e. they all apply at once; they admit
of no exceptions; they do not necessarily refer to binary features, i.e. they can assign
integer values to features; and they are "diachronically persistent", i.e. resistant to loss.
The last criterion, of course, means that any new phonological rules will automatically be
added before such phonetic rules.

Let us return for the moment to Sievers' Law. Certainly, in Proto-Indo-European
there is no evidence that Sievers' Law is crucially ordered with respect to any other
phonological rule; Proto-Indo-European syllabification of sonorant sequences fed
Sievers' Law (Ringe 2006:16), but Sievers' Law did not feed any other rules. Moreover,
Sievers' Law had no exceptions, as far as we can tell, though there is the question of
whether it applied to word-*initial* sequences as well as word-internal ones (see discussion
in Ringe 2006:16-17).

On other hand, there is no evidence that Sievers' Law referred to non-binary
features. Whether we think of it as insertion of a vowel segment, or as rewriting [-

syllabic] [j] as [+syllabic] [i], these categories remain binary and discrete. Finally, the diachronic persistence of the rule is precisely what is under question here: we know the rule existed both in Proto-Indo-European and in Proto-Germanic, but the question is whether the rule continued to be exceptionless in the transition between the two stages, or else if there was an intermediate period of opacity as in (10).

So Sievers' Law fulfills at least two of the criteria for a phonetic rule. The problem remains that the distinction between phonological and phonetic rules, as presented by King, is unconvincing. Firstly, there is no reason to think phonological rules must have exceptions or be crucially ordered, as opposed to phonetic rules which must not. Rather, they *may* or *may not* have exceptions or be crucially ordered; in other words, absence of exceptions or crucial ordering are *not* diagnostic of phonetic, as opposed to phonological rules, *pace* King. It would be more accurate to say that phonetic rules, as defined by the latter two criteria, also happen to fulfill the former two, but that these two conditions, transparency and lack of ordering, do not apply only to phonetic rules.

Middle German final devoicing was also clearly a phonological, not a phonetic rule. The fact that the neutralization was represented in the writing, e.g. *wëc, wîp,* etc., strongly argues for a true phonemic neutralization, i.e. a neutralization of a distinctive feature opposition (see also next subsection on incomplete neutralization). The structural description of the rule, in other words, itself forbids us from attributing devoicing to the phonetic component on synchronic grounds.

By way of comparison, a good example of a true phonetic rule (often known as "phonetic implementation rule") is the tensing of /æ/ in Northern Cities American English (Labov, Yaeger & Steiner 1972, Labov 1994). There is no clear-cut, binary

distinction between tense and lax /æ/; instead, we find quite fine-grained phonetic conditioning, e.g. there is a statistically significant difference in degree of phonetic tensing depending on whether the vowel is preceded by a coronal or a dorsal consonant, a single consonant or a cluster, or whether the vowel is in an open or a closed syllable. These conditions involve more than simply binary oppositions and cannot be easily captured in a distinctive feature framework[67].

The only criterion left to us, in that case, is the diachronic one. If we know of a case where an older rule applied at once and without exception to the outputs of a newer rule, then that constitutes evidence that the older rule is phonetic, not phonological. However, in the case of reconstructed languages like Proto-Indo-European and Proto-Germanic, we do not have the evidence to make this argument, since not all the intermediate diachronic stages are available to us, but only those that can be determined by comparative or internal reconstruction.

So Sievers' Law, and Early Modern German final devoicing, might be called phonetic rules on the grounds that they seem to apply automatically to the outputs of phonological apocope, but this is only because we are comparing the situations before apocope begins and after it has concluded and any analogical leveling may have occurred. If it were not for these diachronic facts, there would be no good reason to consider either rule a phonetic rule.

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[67] Note, however, that Kiparsky treats this gradient phonetic implementation rule as a postlexical phonological rule (Kiparsky 1989). For him, it appears, there is no meaningful distinction between phonetic and phonological rules, but rather between postlexical and lexical rules. The essential criterion is therefore not one of discreteness versus gradience, but of whether the rule applies before or after syntax and linearization of the syntactic input.

4.4.1   Final devoicing as incomplete neutralization

A word might be said here about "incomplete neutralization" (e.g. Port & O'Dell 1985).

Some experimental studies of spoken Modern German, and other languages with final

devoicing, purport to show that the neutralization rule does not completely eliminate the

underlying laryngeal contrast. Thus, the final coronal [raːt] from underlying /raːd/ 'wheel'

has slightly but significantly more voicing then the coronal in [raːt] from /raːt/ 'council'.

If this is true, then our characterization of Middle and Early Modern German devoicing

as purely phonological may be incorrect, since the rule would not be neutralizing a binary

feature distinction, but would instead be approximating one of the features, i.e. [+voice],

to the other, i.e. [–voice], in such a manner that there is partial overlap in perception.

However, Fourakis & Iverson 1984 showed that the partial realization of the

underlying contrast found in these experiments is only manifested where speakers are

conscious of the underlying contrast through the reading of the relevant minimal pairs,

since Modern German orthography, as noted above, represents the underlying contrast,

and does not show final neutralization. Where speakers are not made conscious of the

underlying contrast, i.e. where they do not have access to the orthographic representation,

the neutralization appears to be complete, i.e. we are looking at neutralization of discrete

phonological categories, not the phonetic approximation of one category to another.

Given that the devoicing rule of Modern German is clearly phonological, we have no

good reason to suppose the Middle German rule was any different (cf. below, on the

orthographic evidence).

4.5   Final devoicing as a postlexical rule

Although we have no good reason to suppose Middle German final devoicing was phonetic, rather than phonological, it is possible that it was a postlexical phonological rule. If this is the case, then the addition of an apocope rule may have resulted in insertion of apocope before devoicing in the derivational series. We cannot account for this by the fact that apocope was added as a lexical phonological rule, since we showed above that the morphologization of apocope is not consistent with a single morphological level, and in any case, the morphological factors in the distribution of final schwa can be attributed to analogical changes taking place after apocope occurs *qua* sound change.

But we may be able to claim that both final devoicing and schwa apocope were postlexical rules, in which case, under the assumptions of LPM, they would have to be arranged in transparent, feeding order, because opaque rule ordering is not allowed in the postlexical component of phonology. We could conceive of postlexical devoicing as follows: although cyclic syllabification applies only within the word domain (including the syllabification of clitics within the prosodic word), devoicing may apply postlexically on the assumption that the syllable boundaries established by lexical syllabification are still visible after syntax, since devoicing properly applies at the syllable edge.

However, if this is the case, apocope ought to have applied at the postlexical level as well, since it also applied to the output of the cyclic syllabification and foot-building rules, and the evidence that devoicing was postlexical is not good. Paul 2007 claims that there are cases of devoicing being blocked where the word in question is followed by a clitic, e.g. *neig er*, not **neic er*, 'he leaned'. Yet cliticization is usually treated as a distinct process from syntactic linearization, i.e. it is a special phonological operation that

takes place after word building but before syntactic phrasing. So *neig er* can be thought of as a single *prosodic* word for the purposes of word-level syllabification and final devoicing[68].

In that case, we find that devoicing always and only applies within the domain of the word, making it strictly speaking a *lexical* rule, albeit a *postcyclic* one, because it applies after all the syllabification cycles that take place after each level of morphology. In German (unlike some other languages), there is no syllabification cycle after syntax. Therefore, we do not expect the apocope rule to have been inserted before final devoicing in the series of rules. If, on the other hand, we treat final devoicing as postlexical, then we must also treat apocope as postlexical, since the conditioning environment for the two is the same, i.e. the right edge of the word.

4.6   Intrinsic rule ordering

The preceding discussion has assumed that rules are ordered *extrinsically*, i.e. that the order of rules in any given language is essentially an accident of history. Under the assumptions of extrinsic rule ordering, the synchronic order of rules should reflect the chronology of changes, unless other factors trigger restructuring or insertion. Restructuring occurs if the grammar resulting from rule addition is more complex than necessary to account for the facts, while insertion occurs if the rule being added belongs to a different module of grammar from the older rule in question. We have already shown

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[68] As it happens, this bleeding effect of following vowel-initial clitics was not observed in my search of the Bonn corpus, i.e. *gap* etc. were found before clitics like *er* as often as before non-clitics, whether vowel-initial or consonant-initial.

that the conditions for rule insertion, as established by Halle 1962, are not met with respect to the facts of apocope and devoicing as we know them.

An alternative approach, however, is to assume *intrinsic* rule ordering (Koutsoudas, Sanders & Noll 1974). According to this theory, rules should normally be ordered in such a way that they all apply maximally. In other words, universal grammar predicts that there should be no opacity. This theory helps to explain why opaque grammars tend over time to be restructured into transparent orders. This theory should also predict that, when rules are added to the grammar through sound change, they are added at the point in the derivational series where they will apply to the maximal extent. So, according to intrinsic ordering theory, we expect apocope to have been added to the phonology before devoicing because that way devoicing would apply maximally, i.e. transparently, to the outputs of apocope.

The empirical failure of intrinsic rule ordering was noted already in the 1970s (King 1976). In the context of the Early Modern German, we already have the examples of Yiddish and Upper German to show that intrinsic ordering is not justified by the data. In response the proponents of intrinsic rule ordering might stipulate mechanisms that would permit at least temporary opaque ordering, with the result that the concept underlying intrinsic ordering theory, Minimization of Opacity (King 1976:79) would be relegated to an overall principle, similar to markedness, that would drive learners eventually to restructure opaque orderings into transparent, feeding orderings where possible. In short, intrinsic rule ordering is not strong enough as a theory to lead us to believe that apocope was inserted before devoicing in the grammar.

4.7   Phonologization and opacity

There is one last reason to be skeptical about rule insertion, independent of the predictions of different theoretical frameworks: what does our understanding of *phonologization* predict concerning rule insertion? The discussion so far has assumed that phonological rules are added instantaneously to the grammar, but the fact is that the addition of phonological rules is itself a process, and within that process we might find a clue as to why we predict the addition of apocope to result in opacity.

Phonologization is the process whereby phonological rules enter the grammar, through the reanalysis of performance-related effects, like co-articulation, as grammatical variables (Hyman 1976, cf. Bermúdez-Otero 2007). For instance, in all languages, dorsal stops are slightly palatalized before front high vowels. This is because of the predictable acoustic effect that occurs during the transition from the stop articulation, where the body of the tongue is raised towards the back of the oral cavity, to the vowel articulation, where the body of tongue is moved towards the front of the cavity. Even if the language has no palatalization rule, this effect is significant upon acoustic analysis.

Why is it that some languages nevertheless have a palatalization rule over and above this coarticulation effect, e.g. Italian, Swedish? This occurs when the learner interprets the acoustic effect as phonologically significant, i.e. the slight *phonetic* palatalization is interpreted as the output of a phonological rule, which rewrites underlying stop as surface affricate or fricative. In this way, the addition of phonological

rules is no longer spontaneous, but is itself the product of re-analysis of extra-linguistic phonetic effects[69].

When we turn to Early Modern German, we can imagine the phonologization of apocope in the following way. Since the final schwa is unstressed and centralized, we can imagine that it would often be only faintly articulated, or not at all. This effect would originally have nothing to do with a deletion rule; the vowel would still be present in the speaker's phonological surface representation. But the learner does not know what the representation is supposed to be, so he or she will misperceive this irregular acoustic deletion as *phonological* deletion. Hence, a rule will be added to the grammar to account for the deletion.

Of course, this rule will have to be variable. Since only some of the schwas will have disappeared in the acoustic signal, the rule that the learner posits to account for the disappearance also has to take into account the fact that elsewhere there is a vowel. The input of the rule is the variant with final schwa; the output is the variant without final schwa. The ratio of the former set of variants over the latter will be expressed as a probability value attached to the variable rule.

However, we still have not accounted for why the variable schwa deletion rule is added to the end of the series of rules, resulting in a counter-feeding order, and not earlier in the derivation, so that it feeds devoicing. The deletion of schwa is not targeting the

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[69] In fact, the transition from phonetic effect to phonological rule may be more complicated than this. As we mentioned before (p. 17), there is also such a thing as a gradient phonetic rule, i.e. a rule manipulating phonetic features that are more fine-grained than binary distinctive features, yet the output of such a gradient rule is acoustically more significant than a mere coarticulation effect (see discussion of Northern Cities /æ/-tensing in Labov, Yaeger & Steiner 1972). So the course of events is as follows: coarticulation effect, then gradient phonetic rule, and then categorical phonological rule. When considering change like schwa apocope, on the other hand, and its relationship with devoicing, it only matters whether the vowel is present or not present, so we only need to deal with the transition from phonetic effect to phonological rule.

inputs or outputs of the devoicing rule, so why do the learners fail to apply devoicing to the outputs of schwa deletion? Is there really some universal formal constraint on grammar change that forbids rules from being added anywhere other than the end of the series?

This question assumes that learners will *already* have acquired a transparent devoicing rule, even as they posit a deletion rule to account for the variable absence of expected final schwa. Yet the absence of final schwa must necessarily accompany an apparent exception to final devoicing in cases like [tag], for expected [tagə]. Given that acoustic deletion of schwa necessarily results in surface exceptions to final devoicing, we now see how opacity is a necessary outcome of this kind of phonological innovation.

We cannot predict for certain that learners will be easily able to acquire rules that are ordered opaquely, if both rules are phonologically predictable. Kiparsky 1978 noted that the effect of rule re-ordering might arise where learners acquire rules in the "wrong" order. Take final devoicing and apocope. In order for opacity to arise, learners must acquire the devoicing rule *first*. If, on the contrary, they acquire the apocope rule first, then the outputs of apocope should provide the inputs to devoicing when it is acquired later.

However, if we acknowledge that even an earlier acquired apocope rule creates exceptions to the surface pattern of devoicing, then it will be impossible to acquire transparent devoicing either before or after apocope is acquired. The learner will then face a choice between an analysis in which the devoicing rule exceptionally fails to apply to the outputs of apocope, or one in which devoicing is simply ordered before apocope in

the derivation. The latter is simpler and therefore we predict learners will choose it, all else being equal.

4.8   Conclusions

The problem is that there are, as we have seen, unambiguous examples of regular sound change introducing opaque grammars. We have the examples of devoicing and apocope in Yiddish and Early Modern German. Other well-known examples include Verner's Law, a pre-Proto-Germanic change whereby fricatives became voiced when preceded by an unaccented syllable: late Proto-Indo-European /paté:r/ 'father' > /faθé:r/ > /faðé:r/, cf. /bʰrá:te:r/ 'brother' > /bró:θe:r/ > Gothic /ˈbro:θar/. Subsequently, the accent was shifted to the initial syllable in all words: /fáðe:r/, from which we eventually get Gothic /ˈfaðar/, and English *father*. After accent retraction, Verner's Law applied opaquely; we do not find /faðe:r/ changing to */faθe:r/, which is what should have occurred if rules were ordered intrinsically.

The general conclusion to be drawn from this review comes down to the following: the mere theoretical *possibility* of rule insertion does not outweigh the firm empirical evidence *against* rule insertion in the case of Early Modern German final devoicing and schwa apocope. To this is related the broader observation that rules develop in very predictable ways. As noted in Kiparsky 1989 and then in McMahon 2000b, rules always seem to begin as gradient phonetic rules, later undergoing phonologization as postlexical rules, then morphologization as lexical phonological rules,

before finally being completely lexicalized and removed from the grammar. The evidence from Early Modern East Central German supports this historical model and does not provide good evidence to support the rule insertion hypothesis.

5   Opacity and restoration of transparent devoicing in East Central German

In this section, we will accept that the written evidence concerning the 14th and 15th century East Central German texts is accurate, and that devoicing really did become opaque. This includes both the evidence for opaque devoicing, i.e. significantly higher rates of devoicing in the non-apocopated grammatical categories of words, e.g. *tac >tac,* but *tage > tag*, and the evidence for actual loss of devoicing, i.e. the leveling of final voicing to the non-apocopated categories, e.g. *tac > tag*.

That the written evidence of 14th and 15th century East Central German should be treated as reliable is independently confirmed by the fact that final devoicing continued to be robustly attested in the spelling up until the 16th century (Ewald 1997, Mihm 2004), whereas in Upper German, as we have seen, it was mostly lost by the end of the 15th century. What we find in East Central German, in other words, is a rapid transition from a situation where final devoicing is robustly attested and apocope has only begun to make inroads, to a situation where devoicing is lost completely, and yet apocope still has not gone to completion and has even been reversed in some cases. This strongly suggests that the loss of devoicing in East Central German, unlike Upper German, was not directly caused by apocope, but was due to some fundamental change in spelling conventions.

Therefore we will consider the evidence of loss of devoicing in the 16th and 17th century texts to be insufficient to prove the loss of devoicing in East Central German, because apocope never went to completion in those areas. We can suppose that the East Central German printers adopted the convention of not representing devoicing from the Upper German printers in East Franconia, where devoicing *had* been lost. In that case, we must explain how opaque devoicing managed to become transparent again in the phonology of East Central German.

5.1   Analogical restoration of final devoicing

As in Dutch, the loss of final schwa in Early Modern German, whether by regular, conditioned sound change, or else by analogical re-modeling, will in many cases have introduced new final voiced obstruents: *obe > ob, unde > und, allerhand > allerhand, herzoge > herzog*[70]. Although this is not reflected in the modern spelling, final devoicing has applied to all such words in spoken Modern German.

One possibility is that we attribute this second devoicing to analogy. In other words, the final /g/ of DSg *Tag* is remodeled on the analogy of the other forms that have final devoicing, such as NSg *Ta[k]*. However, only forms that participated in alternations within paradigms would be liable to such analogical remodeling. Thus, dative singular [taːg] could become [taːk] on the analogy of the paradigmatically related nominative singular [taːk]. However, words that did not participate in paradigmatic alternations

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[70] Remember that the failure of apocope to occur where the preceding segment is a voiced obstruent only applies to disyllables, i.e. where the schwa comes between the primary stressed syllable and the word boundary. After the secondary stressed syllable, Behaghel's Law takes precedence, as in *allerhand*; in the case of *obe > ob*, we are looking at the late Middle German apocope affecting unstressed disyllables.

cannot be expected to undergo analogical remodeling, and yet devoicing is seen to apply

to them as well, e.g. *obe > o[p]*. For such cases, an explanation other than analogical

remodeling is required.

A further problem is that analogical change is meant to proceed word by word,

and a lexically gradual change is not expected to yield the overwhelmingly regular results

that second final devoicing show. If devoicing were analogically extended to the new

final voiced obstruents, we would expect some forms not to undergo analogical

remodeling, such as the occasional **Ta[g], *o[b]* and so on. The fact that final devoicing

is so pervasive in the modern language calls out for another explanation.

5.2   Rule-based restoration of final devoicing

Rather than the product of lexically gradual analogy, we would argue that second final

devoicing was the result of a synchronic devoicing rule, of the kind described at the

beginning of this chapter[71]. As noted above, Middle German, as far as we can tell from

the manuscripts, had a robustly attested devoicing rule, and it makes sense to say that this

rule is responsible for the later analogical extension of devoicing to new final voiced

obstruents that arose from late Middle German and Early Modern German apocope.

However, the evidence that we have seen argues strongly for opacity in Early

Modern German final devoicing, as a result of the apocope of final schwa. In other

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[71] Hock 1991 has a useful chapter (pp. 238-280) on the correspondence between 'regular' analogical change, and the generative concept of the synchronic rule. While in fact cases of analogical change could be either regular or irregular, there was nothing in the analogical model that would predict regular outcomes, since it supposedly always proceeded word by word. Hock shows how the concept of synchronic rules has helped to explain many formerly inexplicable cases of 'regular' analogical change, but at the same time has thrown up problems such as the one described here, which would not have occurred to linguists working under traditional assumptions.

words, Early Modern German corroborates what we reconstruct for the ancestor of Yiddish. Assuming that this is true, we need to explain how devoicing, although now opaque as a result of apocope, nevertheless re-applied to all the outputs of schwa apocope, rather than being eliminated from the grammar as Yiddish devoicing was.

5.2.1 Rule re-ordering

We have seen that, although rule insertion cannot be completely ruled out, neither the structural description of final devoicing nor of schwa apocope leads us to expect insertion, even were we to leave aside the strong empirical evidence against insertion of apocope that we discussed in the previous chapter. Another option, then, is restructuring of the grammar *after* rule addition occurs, which would consist in the *re-ordering* of the rules from an opaque, counterfeeding order to a transparent, feeding order. Thus the re-application of both Sievers' Law and Early Modern German final devoicing can be explained as the outcome of rule re-ordering.

Consider the example of Sievers' Law. First we predict that Epenthesis would be added at the end, and then the order of rules would be reversed, resulting in the application of Sievers' Law to the outputs of Epenthesis. Epenthesis must be added at the end because it is a categorical, phonological rule. After the addition of Epenthesis at the end of the derivation, however, re-ordering occurs, triggered by some consideration of markedness or else learner-driven reanalysis.

One motivation for restructuring of grammar, including re-ordering, is the desire to reduce excess complexity. However, there is strictly speaking no difference in

complexity between an opaque grammar and a transparent grammar: complexity is only increased if there are more rules than are needed to account for the surface alternations. Therefore, other motivating factors for grammar restructuring must be sought out.

According to Kiparsky 1968, rules should be re-ordered if they are in counter-feeding or bleeding order, to feeding and counter-bleeding orders, respectively, owing to the inherent *markedness* of counter-feeding and bleeding orders. And the ordering of Epenthesis after Sievers' Law is indeed a counter-feeding ordering: that is, if Epenthesis were instead ordered *before* Sievers' Law, then Epenthesis would *feed* Sievers' Law. So, even according to Kiparsky's original conditions, Proto-Germanic Sievers' Law is a good candidate, since an unmarked ordering replaces a marked one.

According to the revised conditions on re-ordering that King follows in his article (see also Kiparsky 1971)), we find that ordering u-Epenthesis after Sievers' Law is still marked. The revised conditions hold that re-ordering is prompted:

- by the desire to eliminate opacity

- by the desire to minimize allomorphy (paradigm pressure)

As we saw before in the discussion of Yiddish apocope and devoicing, opacity is defined as follows (Kiparsky 1971):

- A rule $A \rightarrow B / C\_\_D$ is opaque to the extent that there are surface representations
    - (i) of the form A in environment $C\_\_D$, or

    o   (ii) of the form B in environment other than C__D

The former type generally corresponds to counter-feeding order (see also Bakovic 2007).

Let A be the sequence Cj, and B the sequence Cij, i.e. the input and output of Sievers'

Law. As for the environment, C is the preceding sequence VC, and D is the following

segment V. Examples like */wurgjeti/ would be examples of opacity type (i), because the

sequence A = Cj, appears in the environment VC__V, rather than the sequence B = Cij.

      Thus, we say that the counter-feeding ordering of (11), with surface [wurgjeti]*,* is

opaque, i.e. the Sievers' Law rule is contradicted on the surface, since Epenthesis creates

segment sequences that fit the structural description of Sievers' Law, and yet Sievers'

Law does not apply to them; in other words, Sievers' Law is not applying to its maximal

possible extent. Under the assumptions that opaque rule orderings are marked, we expect

a re-ordering into the *transparent* ordering of (13), with surface [wurgijeti], in which the

Sievers' Law rule applies maximally, i.e. the ordering in which there are no surface

exceptions to either rule[72].

      In the same manner, the opaque order of final devoicing and schwa apocope in

(12) should have triggered re-ordering into the following unmarked order:

    (52)   UR   /obə/   /tag/

             Apocope   ob   –

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[72] The other condition of rule re-ordering, the minimization of allomorphy, may be contradicted here, since Sievers' Law creates allomorphy between two surface forms of the underlying suffix /je/: [je] and [ije]. Therefore, we might expect the paradigm condition to eliminate Sievers' Law completely, rather than encourage its maximal application. However, since Sievers' Law was only affecting *suffixes*, rather than the stems, one might argue that the paradigm condition does not apply, because only stem allomorphs should be subject to paradigm leveling (Don Ringe, p.c.).

Devoicing   op   tak

This solution, as it happens, requires us to reconstruct a hypothetical period where an opaque grammar *did* exist, but for which the evidence has been lost owing to re-ordering.

5.2.2   Rule re-affirmation

Hock 1991:269 speaks of "rule re-affirmation" to explain cases where a rule temporarily acquires opacity as a result of some change, but instead of being lost, somehow retains productivity and re-applies to the exceptions that have resulted (see also Krishnamurti 1978). In his formulation, the synchronic motivation for re-application, or re-affirmation, is unclear, because all that happens is that a copy of the opaque rule is added to the end of the derivational series:

(53)   UR   /obə/   /tag/

       Devoicing(1)   --   tak

       Apocope   ob   --

       Devoicing(2)   op   --

There is no explanation of why the rule is copied in that particular example, and not in another example, such as Yiddish final devoicing. If we hypothesize, however, that, for some reason, the opacity of devoicing in Yiddish hindered the productivity of the rule, while the opacity of devoicing in Early Modern German did not, then we may be able to

find an explanation for the different behavior of the devoicing rule in the subsequent histories of the two languages.

5.2.2.1 Finnish *t*-spirantization

Kiparsky noted the following (Kiparsky 1971): "The more opaque a rule, the more likely it is to develop exceptions." This means that, while surface exceptions to a rule may be understood by the learner to be the artifacts of synchronic opacity, there is always the possibility that the learner will instead interpret the surface exceptions as *true* exceptions to the rule, i.e. what we referred to earlier as the *morphologization* of the rule. However, there is no way for us in principle to determine when the learner will make this kind of error or not, as long as both exception marking and opacity are possible analyses of the data[73].

Kiparsky 1973 provides details on a particular historical case that point to a solution. The rules in question are from Finnish, namely *t*-spirantization and vowel contraction:

(54)　*t*-Spirantization　　　t → s / __ i

(55)　Vowel Contraction　　V → ∅ / __ i

An example of the former is *halusi* '(he) wanted', from /halut+i/, while an example of the latter is *piti* '(he) held' from /pitä+i/.

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[73] See Kiparsky 1971 and 1978. See also the recent discussion in Vaux 2008 and references on opacity and learnability in rule-based phonology; for the same issue in OT, see Bermúdez-Otero 2003.

As we can see, both rules apply before underlying /i/, and hence they may potentially interact in an opaque manner. Thus:

(56)   UR   /haluti/   /pitäi/

        Spirantization   halusi   --

        Contraction   --   piti

The opaque ordering is counter-feeding, thus it is "type (i)" opacity according to Kiparsky's formula.

This chronological ordering meant that spirantization became opaque. As a result of this opacity, spirantization acquired exceptions. At the same time, however, spirantization remained a productive rule, and some of the exceptions resulting from opacity were gradually eliminated at later stages of the language.

Thus, the verb '(he) sped' can be either *kiiti* or *kiisi*, both from underlying /kiitä+i/. Moreover, examination of earlier recorded stages of Finnish, as well as of regional dialects preserving more archaic patterns, shows that the counterfeeding ordering is more characteristic of older stages of the language, whereas in more recent Finnish we find the feeding order below:

(57)   UR   /kiitä+i/

        Contraction   kiiti

        Spirantization   kiisi

This would be easy to explain as the repair of a marked grammar by rule re-ordering, but for one thing: productive application of spirantization to new inputs is morphologically restricted. In other words, we only find it in the past tense of verbs whose stems end in /t/, and even in that category there are many exceptions (e.g. whereas 'sped' can be either *kiiti* or *kiisi*, 'held' is always *piti*). Other categories where spirantization never occurs include past impersonal verbs, conditionals, derived verbs, derived adjectives, and derived nouns:

(58)   Past impersonal: /men+tä+i+hen/ –> *mentiin* 'one went'

Conditional: /tunte+isi+n/ –> *tuntisin* 'I would know'

Derived verbs: /sota+i+ta/ –> *sotia* 'to wage war'

Derived adjectives: /vete+i+nen/ –> *vetinen* 'watery', cf. *vesi*

Derived nouns: /sonta+iai+nen/ –> *sontiainen* 'dung beetle'

Noun plurals: /sota+i+na/ –> *sotina* 'wars' (essive)

Even though in all these categories we find outputs of contraction meeting the structural description of spirantization, it is only in the past tense of personal verbs that we find the re-affirmation of spirantization, and even here it does not apply at the same rate in all verbs.

Kiparsky's solution is to reject re-ordering completely, and instead to claim that, after contraction occurred and rendered spirantization opaque, spirantization acquired morphological and lexical exceptions (the "exception-marking" solution), and what we see is the gradual elimination of these exceptions over time. So, wherever contraction

resulted in absence of expected spirantization throughout an entire category, such as derived verbs, we find *no* re-application of spirantization.

This is easy to explain if we suppose derived verbs to be categorically excluded from undergoing spirantization by the "marking" theory, but if we suppose re-ordering, we have to explain why re-ordering produced expected transparent spirantization only in one particular category, namely the past tense of personal, non-derived verbs. In other words, we *have* to introduce marking of exceptions, even if we interpret this as a case of rule re-ordering. We can choose to say the rule was marked with exceptions from the beginning, or else was marked with exceptions immediately after re-ordering. The former solution is simpler and hence preferable[74].

From these observations, we can suggest the following hypothesis concerning Early Modern German second devoicing: when the addition of schwa apocope caused final devoicing to become opaque, the opaque rule acquired exceptions. Since exceptions increase a rule's complexity, the rule became harder to learn. Learners then attempted to reduce the complexity by eliminating the exceptions[75].

5.2.2.2 Second final devoicing in Dutch

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[74] Note that both contraction and spirantization are productive rules, but despite the fact that they could be ordered with respect to each other, Kiparsky is claiming that they apply independently and in an unordered fashion. The exceptions to spirantization have been encoded in the description of the rule itself; they are not artifacts of opaque ordering.

[75] This fits with recent acquisition-related work by Charles Yang (Yang 2008) on exceptions and the productivity of rules. This analysis of re-ordering as restructuring of the rule followed by gradual "re-application" also fits the case of Proto-Germanic Sievers' Law. Thus, after pre-sonorant vowel epenthesis occurred, the number of *expected* exceptions to Sievers' Law would have been very small; this author counted about ten possible cases that should have survived from Proto-Indo-European to Proto-Germanic, based on the Proto-Indo-European verbal lexicon (Rix et al. 2001), out of well over a hundred.

This hypothesis about second final devoicing in Early Modern German is confirmed by Early Modern Dutch. As in Early Modern Upper German, apocope should have rendered the devoicing rule opaque, so that devoicing would have become unproductive in at least certain contexts, e.g. in nouns and parts of the verbal paradigm. Yet in modern Dutch, devoicing is a transparent rule[76]. For this reason, Goossens speaks of a "second final devoicing" (Goossens 1974:82-3), to account for examples like *we[b]e* 'web' > *we[p]*. In his formulation, second devoicing was an actual sound change, independent of the OD sound change. In this, Goossens followed strict historical methodology, and did not appeal to the application of a synchronic devoicing rule.

Other phonologists did raise this possibility, however (Goossens 1977:3-4 and references, all in Dutch). It is noteworthy that they assumed an automatic devoicing rule would apply at once to all new inputs deriving from apocope, i.e. they did not notice the opaque, counterfeeding ordering that would have arisen from adding apocope *after* devoicing, as generative historical phonology predicts. Goossens unfortunately does not raise this criticism in his response (Goossens 1977:5f.), but rather displays skepticism towards generative phonology and synchronic rule systems in general.

Yet his dismissal of the synchronic rule hypothesis cannot be itself dismissed as mere traditionalist reaction. Rather, Goossens brought forth evidence from dialect surveys in the Netherlands, showing that where apocope recently applied, devoicing did *not* apply at once to the outputs of apocope, but instead apocope gave rise to exceptions to devoicing, which only later were eliminated as devoicing re-asserted itself.

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[76] On the other hand, as in Modern German, Dutch spelling does not represent the voicing alternation in stops and the fricative /ɣ/, though it does represents the alternation in the fricatives /v/ and /z/, unlike in German.

As with the German dialectal evidence, the Dutch evidence (neatly sketched on the maps in Goossens 1977:11, 15) draws from dialects straddling the borders dividing apocopating from non-apocopating dialects. The latter include the dialects of the northeast Netherlands, commonly called Dutch Low Saxon (since they are more closely related to the Low German dialects across the border in Germany than to standard Dutch), and the West Flemish dialects of the extreme southwest of the Netherlands and the western end of Dutch-speaking Belgium.

In these areas, owing to the recentness of apocope, the resulting exceptions to devoicing are still in evidence, e.g. *be[d]*, cf. Middle Dutch *be[d]e* 'bed', or *ru[g]* 'back', Middle Dutch *ru[g]e* (Modern Standard Dutch *ru[χ]*, with Middle Dutch /g/ entirely replaced by /ɣ/). So, Goossens certainly shows that devoicing does not *automatically* apply to the outputs of apocope; rather, some time must pass after apocope has occurred before devoicing re-applies to the apocopated forms[77].

Whether devoicing re-asserted itself within the dialect, or whether it spread back into the recently apocopated dialect from neighboring dialects where it had never been lost is unclear from Goossens' discussion. The latter is a distinct possibility, because apocope should have given rise to many exceptions that would have made it difficult for learners to continue analyzing devoicing as a transparent phonological rule. The non-apocopating dialects, where devoicing had not acquired exceptions and remained transparent, would still be in contact with the apocopating dialects, where devoicing was becoming opaque, and so there would have been much opportunity for devoicing to spread back. This kind of explanation may well also lie behind the restoration of

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[77] In Goossens 1977:14ff, we see how devoicing was observed to re-apply gradually to the exceptions.

devoicing in apocopating dialects of German (see above on Silesian and Luxemburgish), as well as literary Modern German (see below on Low German influence).

That being said, another explanation for the restoration of final devoicing in these dialects is that devoicing remained productive, despite the exceptions, in the same way Finnish spirantization remained productive despite the exceptions introduced by vowel extraction. Such an explanation, of course, depends on there being too few exceptions to prevent the continued productivity of the devoicing rule. Since we know that apocope applied a bit more haphazardly in Dutch than in Upper German or Yiddish, this may explain the retained productivity of final devoicing. Similarly, since Early Modern East Central German apocope was quite haphazard, the re-affirmation of devoicing is easier to explain thereby.

5.2.3   East Central German apocope and re-affirmation of devoicing

When apocope occurred in Yiddish, we concluded that final devoicing became unproductive, because of all the exceptions that would have accrued in the surface application of devoicing. Such an unproductive rule would have been liable to loss, as learners gradually eliminated complexity from the grammar by ceasing to apply the by now fully morphologized and lexicalized devoicing rule.

Yet as we saw with Finnish and probably with Dutch, merely having exceptions is not enough to hinder productivity. A sufficient number of exceptions are necessary, such that the learner will fail to perceive any phonological regularity in the rule in question. Since apocope in Yiddish applied to a very large number of forms, learners would have

been forced to conclude that devoicing was a morphophonological rule at best. On the other hand, because vowel contraction only affected a few forms of the past tense in Finnish, learners were still able to perceive the phonological regularity of spirantization in that category. For them, the complexity lay in the small number of listed exceptions to spirantization, which they naturally eliminated in later generations.

East Central German apocope appears to be more akin to Finnish spirantization. The Middle German apocope targeting unstressed disyllables like *unde* and *abe* must indeed have resulted in word-final voiced obstruents. Yet, since final devoicing would still have been overwhelmingly regular and predictable, it is not hard to understand why devoicing then applied to these outputs. Yiddish *op* also attests to this; apocope had applied to this form significantly earlier than to other forms, so that devoicing remained productive after *abe > ab*, but not after *gabe > gab* (see e.g. King 1980, Weinreich 1980).

That devoicing became temporarily opaque in East Central German is proven by two things: the 15th century Upper Saxon text we examined, where apocope had progressed far enough to render devoicing significantly opaque (in other East Central German group of texts, the Thuringian texts, apocope never progressed far enough). The other piece of evidence for opacity in Early Modern East Central German devoicing is the peculiar restoration of schwa after voiced obstruents in disyllables that we observed earlier, so that we have *spat* from *spæte*, but *träge* from *træge*.

As we saw, unless we wish to appeal to teleology, or make use of OT (which we saw did not succeed very well in describing the Yiddish developments), a plausible

explanation is that apocope did apply, but that a later change restored final schwa in such forms. This could be an independent sound change:

(59) $\varnothing \rightarrow \vartheta$ / [+obst, +vce]]$_\text{Wd}$ ___

An alternative explanation is that the pattern we see arose from a contact-induced change, not a regular sound change. Considering that the apocopating dialect would be in contact with non-apocopating dialects (e.g. Silesian), we might be looking at some kind of L2 phenomenon, where the presence of final voiced obstruents in the apocopating dialect was interpreted as a poorly articulated final schwa, i.e. a perception error. Alternatively, speakers of a non-apocopating, final devoicing dialect would attempt to acquire an apocopating dialect, together with final voiced obstruents, but would be unable to produce final voiced obstruents in their output, owing to L1 interference, and so they would automatically add a final schwa, which would have been freely available in their non-apocopating dialect anyway.

This makes historical sense, because the old norm was East Franconian, i.e. an apocopating dialect that had lost devoicing. This would be the dialect that speakers in East Central Germany would attempt to acquire up until the Reformation. These East Central German speakers would have spoken, as their normative register, a conservative variety with final devoicing and no apocope[78]. As apocope took place in Upper German,

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[78] We discussed earlier that there was some evidence that inner German lenition had begun to affect East Central German already in the Middle German period. On the other hand, it is not doubted that final devoicing was attested longer in East Central German than in Upper German, right up until the period of standardization in the 16th century. We should probably conclude from this that there were two registers in Early Modern East Central German: an upper register with a voicing contrast and final devoicing; and a lower register with no contrast and lenition. Neither register would have undergone full apocope. The

rendering devoicing opaque, the East Central German speakers who acquired such a dialect would most likely render the new final voiced obstruents with final schwa. They would have no trouble acquiring outputs of apocope that ended in voiceless obstruents or sonorants, however.

That leaves us to account for the outputs of Behaghel's Law, i.e. the regular apocope after secondarily stressed syllables, where the [voice] specification of the preceding segment did not matter (e.g. *allerhande > allerhand*), and those lexical exceptions to the rule that preceding voiced obstruents blocked apocope after primary stress, e.g. *milde > mil[t]*, *schräge > schrä[k]*.

We can make sense of this pattern if we allow that apocope after secondarily stressed syllables occurred before the apocope after primary stressed syllables. The result would be only a few instances of new final voiced obstruents, e.g. adjectives in *–ig*, which would readily undergo still-productive devoicing. This analysis is corroborated by the observation that in Yiddish, the *–ig* suffix did in fact undergo devoicing as *–ik*.

As for the handful of other exceptions to blocking by preceding voiced obstruents, these can be explained as the haphazard application of devoicing by East Central German speakers to apocopated forms in Upper German. I.e. when an East Central German speaker was confronted with forms like *schrä[g]* and *trä[g]*, there were two options: either attempt to articulate the final voiced obstruent, triggering automatic addition of final schwa, or else treat the final voiced obstruent as an "error" and apply regular final devoicing, which was the option chosen for *schräg*.

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evidence for lenition in Early Modern East Central German would be due to interference of local dialect pronunciation in that case.

5.3　Conclusions

We have found that the data supporting the re-affirmation of final devoicing in East Central German is quite strong, unlike the evidence for insertion of apocope before devoicing, which was weak. Since apocope was not an unconditioned change, as it was in Upper German, there would have been significantly fewer surface exceptions to devoicing as a result of apocope, meaning that there would have been consequently that much more evidence for productive, phonological devoicing available to the learner, even after apocope occurred.

However, we found that there was also good evidence for contact effects in East Central German apocope and devoicing, especially in the blocking of apocope after voiced obstruents in words like *träge*. Rather than the Upper German-type scenario, where apocope rendered devoicing opaque, in East Central German it appears that only apocope after secondarily stressed or unstressed syllables was a regular sound change, while apocope after primarily stressed syllables is more clearly a contact-induced change. This raises the question of whether second final devoicing in East Central or northern High German was itself the result of contact, rather than internal developments.

6　Second final devoicing as an independent change in Modern German

The discussion so far has assumed that final devoicing was either never opaque in East Central German, or else had become opaque but not unproductive, later re-affirming itself in the local dialect. We have determined that the latter is the most probable account of events. However, we will briefly consider some alternative hypotheses of the origins of

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Modern German final devoicing, which assume that final devoicing was indeed completely lost from East Central German, and that the loss of devoicing most likely reflects that change. In that case, final devoicing in Modern German must have completely independent origins, which could include either an independent sound change, or else interference from Low German in the new northern centers of normative High German.

6.1 Second final devoicing as sound change

Another way to account for second final devoicing is by positing a sound change, along the lines of Middle German final devoicing, and along the lines of Goossens' reconstruction of Early Modern Dutch second devoicing. That is, after apocope had occurred in Early Modern German, a new sound change or changes of similar or identical structural description to the early Middle German devoicing(s) took place, with the result that Modern German once again has final devoicing, just as its Middle German ancestor had.

The trouble with this is that apocope appears to have been a long drawn out process, with different categories undergoing the change at different stages. We may need to posit more than one devoicing occurring after each stage of apocope takes place: for instance, once after the change deleting schwa in unstressed disyllables, and then once again after Behaghel's Law applied. Since final devoicing is a phonetically natural change, however, it may not be so implausible to posit this kind of scenario.

The problem becomes more acute, however, when we are dealing with analogical extension of apocope. When the final schwa of dative singular *Tage* is lost, for example, it is hard to argue this is part of any regular sound change, since apocope is affecting one morphological category only. Moreover, as Wright notes, apocope is variable, and yet dative singular *Tag* is apparently always pronounced with a final voiceless [k]. If second final devoicing is due to sound change only, it appears we have to posit a new sound change every time one instance of *Tage* is replaced by *Tag* in the language.

6.2   Low German origins of Modern German devoicing

Another possibility is that the devoicing rule of Modern German could have arisen out of contact with Low German in the High German-speaking northern cities of Berlin, Hannover, Hamburg and so on. Up until the late 19th century, the Meissnisch standard, which by now was leniting, was the norm throughout Germany, owing to the prestige of Goethe and others. But then, as political developments (i.e. the growing dominance of Prussia and the unification of Germany) moved the cultural center north, to Berlin, the normative speech of the latter became the new standard of the country. And this norm had final devoicing.

The use of final devoicing in the Berlin dialect may have two sources. One is that devoicing may have been retained in the north for the same reason it was retained in Saxony, and why we find evidence for it as early as Clajus' 16th century grammar: apocope never went to completion. Even if devoicing was momentarily rendered opaque, the fact that apocope never went beyond the variable stage means that there would have

ended up being many fewer exceptions to apocope than in Upper German, with the consequence that re-assertion of devoicing would have been that much more likely.

At this point, we need to briefly describe the origin of High German speech in northern cities. As we know, the north of Germany was formerly Low German speaking. Starting in the late 14th century, however, Low German was replaced by High German in all the major northern cities. The particular dialect source of northern High German, moreover, was the East Central German of Saxony and Thuringia, i.e. non-apocopating or partially apocopating dialects. For this reason, we can imagine that the High German of the north followed the same patterns as those of East Central German. The difference is that, while lenition affected East Central German eventually, it did not spread to northern High German, with the result that when the normative phonology shifted to Berlin and Hamburg, the leniting phonology was replaced by a devoicing phonology.

One of two things may have happened: native Low German speakers, after acquiring High German as a second language in the Early Modern German period, applied their native devoicing rule to the non-devoicing Early Modern German norm, through the process known as "interference" (influence of L1 on imperfectly acquired L2). In a situation where enough L2 speakers display such interference, the interfering phonological pattern can be acquired natively by the next generation.

The other thing that may have caused northern High German to gain devoicing is spread of the devoicing rule from neighboring Low German speaking areas to the High German cities. This requires a certain degree of contact and mutual intelligibility between Low German and High German speakers, which is not impossible, but perhaps less

likely, given that the sociolinguistic pressure seems to have been pretty one-way, with High German spreading at the expense of Low German.

6.3   General conclusions

With respect to Upper German, we have found fairly robust evidence that apocope rendered devoicing opaque, resulting in the eventual loss of the rule, as happened in Yiddish (which appears to be mostly descended from East Upper German itself; see Jacobs 2005). With respect to East Central German, the region from which standard Modern German arose, we have also found evidence that apocope rendered devoicing opaque, although in the data we have reviewed it is largely confined to one Upper Saxon text of the late 15th century. We have not found good evidence that apocope automatically fed devoicing, however, so that the devoicing of the modern language must have some other explanation than simply retention of the rule from Middle German.

Devoicing appears to be attested again in East Central German already by the late 16th century, on the evidence of the grammar of Johannes Clajus. There are two possible causes for this swift re-establishment of final devoicing: the re-affirmation of the rule after a period of opacity, along the lines of the re-affirmation of Finnish *t*-spirantization after vowel contraction occurred. The other cause is the close contact that East Central German would have maintained with neighboring dialects, both High German and Low German, where final devoicing was never lost and from where the devoicing rule could have easily re-entered the language.

We found that final devoicing applied to the outputs of Behaghel's Law, i.e. apocope after a syllable of secondary stress, or the outputs of Middle German apocope, which occurred after unstressed syllable. However, we also found that devoicing applied to the outputs of apocope after syllables of primary stress, as in Upper German and Yiddish, but only where the preceding segment was a voiceless obstruent or a sonorant. This strange pattern suggests that apocope after primary stress in East Central German was a different process from apocope after other syllables, unlike Upper German and Yiddish.

We concluded that the most likely scenario was that apocope first applied after syllables other than secondary stress through regular sound change. This resulted in some exceptions to final devoicing, but the number of exceptions was so few that final devoicing remained productive, and eventually re-applied to the outputs of apocope. This change went to completion in all of Upper, West Central and East Central German. Apocope after syllables of primary stress, on the other hand, only went to completion in Upper German.

The precise social conditions that allowed this situation to occur are hard to recover, but the fact that apocope after primary stress never went beyond the variable stage in East Central German cannot be doubted after considering the textual evidence. Under such conditions, a scenario can be postulated whereby many speakers of a non-apocopating, devoicing variety would have imperfectly acquired an apocopating variety. Owing to L1 interference, they would have been unable to articulate the final voiced obstruents of the former variety, resulting in the retention of final schwa in this environment.

Although the Clajus grammar witnesses to the presence of devoicing in high register East Central German in the late 16ᵗʰ century, we know that by the 18ᵗʰ century East Central German had undergone lenition in all registers, with even Goethe prescribing this pronunciation in his poetry. Final devoicing only becomes the mark of high register German in the 19ᵗʰ century, when the center of linguistic prestige moved from the East Central region of Meißen to the northern cities of Berlin and Hamburg.

In these cities, lenition never occurred. However, we were not certain in the end whether the presence of devoicing in Northern High German was a holdover from the pre-lenition East Central standard, or whether it arose independently, perhaps due to Low German influence. We cautiously come down on the side of retention from older East Central German, since independent evidence confirms that the High German variety of the northern cities is clearly more of an East Central than a West Central or Upper German variety.

Moreover, there is otherwise not much evidence for significant Low German interference in Northern High German; the Early Modern period apparently saw full-scale rapid dialect shift in the northern cities, rather than the situation of extended contact that we saw in Early Modern East Central German, i.e. between Upper and Central German varieties. Some of the classic markers of Northern High German, such as the fricative reflex of Middle German /g/, e.g. /taχ/ for 'day', are also characteristic of Central German. Unambiguously Low German features, like unshifted initial /p/ or /t/, are entirely absent, except in a negligible number of loanwords.

To sum up, we have been able to advance the knowledge of the history of German to a small extent by drawing attention to the robust correlation between apocope and

absence of devoicing in Early Modern German texts, which raises very strong doubts about the "standard" history of the language, which holds the loss of devoicing to be merely a change in spelling convention. At the same time, this discovery undermines one prime example of rule insertion, and hence the notion that phonological innovations can enter the language at any other level than the surface. While we do not deny that subsequent restructuring can obscure the chronology of changes, there appears to be good reason to treat phonological change as a whole as a kind of "life-cycle" of rules. Evidence for rule insertion awaits much stronger empirical confirmation.

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